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VASCULAR PLANTS OF THE CUYAMACA AND LAGUNA MOUNTAINS, CALIFORNIA

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ABSTRACT

A total of 996 taxa are included in this checklist of the vascular plants of the Cuyamaca and Laguna mountains of San Diego County, California. The introduction includes information on climate, geology, and patterns of biogeographical disjunction in this area.

KEY WORDS: vascular plants, Cuyamaca and Laguna mountains, California

This checklist is based on *Plants of Montane San Diego County* compiled by Duffie Clemons (1986) for the California Native Plant Society and the San Diego Natural History Museum. The area covered here includes the Cuyamaca and Laguna mountains of central San Diego County, California and their adjacent foothills. Altitudes range from approximately 910 meters (3,000 feet) on the eastern and western boundaries to a high of 1970 meters (6,500 feet) on Cuyamaca Peak.

The Cuyamacas and Lagunas are parallel, north-south trending ranges that converge in the vicinity of Cuyamaca Lake. Corte Madera Mountain and Guatay Mountain, which are located slightly south of these two ranges, Volcan Mountain, located immediately north, and Poser and Viejas mountains and Mesa Grande, which lie slightly west of the Cuyamacas, are also included. The small settlements of Buckman Springs and San Felipe lie on the eastern boundary. Banner lies approximately five kilometers (three miles) within this boundary. The distance from the western to the eastern boundary is approximately 24 kilometers (fifteen miles), and 40 kilometers (25 miles) from the northern to the southern boundaries.

PHYSICAL CHARACTERISTICS AND VEGETATION OF THE REGION

The Cuyamaca Mountains receive more rain than any other area in southern California of comparable elevation, with the exception of Palomar Mountain. The high rainfall in these mountains is apparently due to their location, within forty miles of the coast and parallel to it, with no intervening ranges to catch the rainfall (Beauchamp 1972). Average annual rainfall totals cited by Wiggins (1929) at various elevations in the mountains of San Diego County, based on periods ranging from 2 to 69 years include the following:

Cuyamaca	100.93 cm	40.37 in	Descanso	59.94 cm	23.60 in
Volcan Mt.	88.25 cm	35.30 in	San Felipe	59.18 cm	23.30 in
Julian	73.71 cm	29.02 in	Mt. Laguna	57.58 cm	22.67 in

Additional data from the County of San Diego Department of Flood Control indicates that yearly rainfall averages approximately 114.3 centimeters (45 inches) on Mount Palomar and 77.47 centimeters (30.5 inches) at Mesa Grande (Allan Rand, County of San Diego climatologist, pers. comm.). The mountains of San Diego County receive a significant portion of their rainfall during the summer months with Hot Springs Mountain and the Laguna Mountains receiving the most summer rain (Raven & Axelrod 1978). Summer rain may help to offset low winter rainfall during drought years, and it is also possible that a more regular pattern of rainfall throughout the year may affect vegetation in other ways. Snow and cold temperatures occur in San Diego County mountains in winter. The highest average annual snowfall of approximately 203 centimeters (80 inches) occurs on Mount Laguna (Lower 1978).

The Cuyamaca and Laguna mountains are part of the Peninsular Range which extends from Mount San Jacinto in Riverside County almost to the southern tip of Baja California. The Peninsular Range is underlaid by the intrusive igneous geologic formation known as the Southern California Batholith. The lighter phases of plutonic (intrusive igneous) rock which contain a higher proportion of light-colored minerals are called granitic, and the darker rocks which contain more dark-colored minerals are known as gabbro.

The Cuyamaca Mountains, Poser, Viejas, and Guatay mountains, Mesa Grande, portions of Corte Madera Mountains and Garnet Peak in the Laguna Mountains are underlaid by gabbro. Chiquito Peak, Stonewall Peak, portions of Corte Madera Mountain, and part of the Volcan Range are granitic. Micaceous schist, a metamorphic rock, predominates on the eastern escarpment of the Laguna and Volcan mountains.

Soils derived from extremely light granitic rock are often sandy and sterile. Soils derived from extremely dark gabbroic rock often form heavy clays that contain highly charges ions of magnesium and iron. Clay soils have a high water-holding capacity, and are also poorly aerated during the winter months. Although both of these extreme soil types are unfavorable for many common species, other less common species are able to tolerate them. Release from competition from the more dominant species may also be a factor which enables some rare plants to persist on these soil types (Oberbauer 1993).

Plant communities within the study area range from coastal sage scrub and chaparral on the western boundary to mixed coniferous forest at the higher elevations, and pinyon-juniper woodland near the eastern boundary. Extensive mountain meadows that retain standing water until late spring are present at higher elevations in the Laguna Mountains. Cuyamaca Lake was called La Laguna Que Se Seca (the lake that dries up) by the early Spanish settlers. The valley in which this lake is located extends from the cismontane to the desert slope of the range, a distance of approximately eight kilometers (five miles) in this area. A dam constructed in 1886 at the western end of the valley now maintains a more permanent lake currently used as a reservoir.

Patterns of Biogeographical Disjunction

A total of 996 taxa are included in this checklist. More than fifty plant species regarded as rare by the California Native Plant Society (Skinner & Pavlik 1994) occur in the Cuyamaca and Laguna mountains. Striking cases of disjunct distribution which appear to be relictual also occur in the mountains of San Diego County. These are species which are common in northern California, but which are known in southern California exclusively, or almost exclusively from this area. It is probable that these species were more widely distributed in southern California during cooler, wetter climatic regimes, and have been able to persist here because of "special soil and precipitation factors" (Munz 1974). Some disjuncts which have evolved into subspecies or varieties endemic to this region are regarded as rare taxa in their own right.

Elisabeth Crow (later Norland), a student of Dr. P.A. Munz at Pomona College, noted in her Master's thesis (1931) that high rainfall and gentle topography are probably among the factors which have allowed many northern species to survive here after being extirpated from the intervening ranges. Other climatic factors may include summer rain and snow in winter. Crow (1931) also noted that disjuncts occur in cismontane and coastal as well as montane areas of both San Diego and Riverside counties where "extreme moist conditions persist". Examples which she cited include *Rhododendron occidentale* (Torrey & A. Gray) A. Gray, *Rosa gymnocarpa*, *Ceanothus foliosus* C. Parry, and *Ophioglossum californicum*.

Other observations also suggest that substrates where "extreme moist conditions persist" play a role in disjunction. Many of the disjunct taxa which occur in the Cuyamaca Mountains are restricted to gabbro soils. *Polygonum parryi* E. Greene, known in southern California only from small populations at Cuyamaca Lake and on Cuyamaca Peak, occurs on vernally wet clay soils. *Epilobium minutum* Lehm., *Aspidotis densa* (Brackener) Lellinger, and *Moehringia macrophylla* are also gabbro-restricted, and the latter two are associated with serpentine soils in northern California. Like gabbro, serpentine weathers to form soils which have a high water-holding capacity, and are also unfavorable for many plant species (Raven & Axelrod 1978).

Two additional disjuncts which are known in southern California only from the Cuyamaca Mountains are associated with vernal pools and wet meadows near Cuyamaca Lake: *Navarretia tagetina* E. Greene and *Downingia concolor* E. Greene subsp. *brevior* McVaugh. Several other disjuncts which are more widely distributed in both the Cuyamaca and Laguna mountains are also associated with vernal pools and drying meadows which may, or may not be, underlaid by gabbro. These include *Minuartia pusilla* (S. Watson) Mattf., *Thermopsis macrophylla* Hook. & Arn. var. *semota* Jepson, *Delphinium hesperium* A. Gray subsp. *cuyamacae* (Abrams) Harlan Lewis & Epling, and *Limnanthes gracilis* Howell subsp. *parishii* (Jepson) Beauchamp.

In the Cuyamaca foothills, *Mimulus congdonii* Robinson, which is disjunct from the Sierra Nevada and Ventura County, occurs on damp, sandy, granitic soils near Descanso. *Ceanothus foliosus* var. *foliosus*, which occurs on gabbro soils in chaparral in both foothill and montane areas of the Cuyamacas, is also a disjunct which is more widely distributed in northern California. *Filago arizonica* A. Gray and *Harpagonella palmeri* A. Gray are coastal-desert disjuncts which are restricted to clay soils on the cismontane slope, but not necessarily so in desert areas.

In general, distribution patterns suggest that many disjuncts have compensated for gradually decreasing rainfall by retreating to habitats and substrates which are moist, and also unfavorable for more dominant plant species. A more complete list of disjuncts occurring in this area, a life form spectrum, and the number of non-native species and genera per family are included in appendices at the end of this checklist.

Documentation

All taxa included in this checklist are referable to the San Diego County synoptic collection housed at the herbarium of the San Diego Natural History Museum (SD). Locations in the Cuyamaca and Laguna mountains are also documented in the main collection at SD and, in some instances, in herbaria housed at the University of California, Riverside (UCR) and at Rancho Santa Ana Botanic Garden, Claremont (RSA-POM).

New locations, not cited by Beauchamp (1986), are included for a few taxa. County range extensions are documented with collector's name and number, and herbarium accession number in the *Checklist of the Vascular Plants of San Diego County* (Simpson, *et al.* 1994). Scientific nomenclature follows Hickman (1993). Common names are taken from Beauchamp (1986) and Hickman (1993).

Vascular Plants of the Cuyamaca and Laguna Mountains

Symbols used in this list are explained at the end of the list.

FERNS AND FERN ALLIES

ASPLENIACEAE/Spleenwort Family
Asplenium vespertinum Maxon. Corte Madera Ranch, Cedar Creek

AZOLLACEAE/Mosquito Fern Family
Azolla filiculoides Lam. Pacific mosquito fern

BLECHNACEAE/Deer Fern Family
Woodwardia fimbriata Smith Giant chain fern

DENNSTAEDTIACEAE/Bracken Family
Pteridium aquilinum (L.) Kuhn var. *pubescens* (L.) Underw.

DRYOPTERIDACEAE/Wood Fern Family
Cystopteris fragilis (L.) Bernh. Brittle bladderfern
Dryopteris arguta (Kaulf.) Maxon Coastal wood fern
Polystichum imbricans (D. Eaton) D.H. Wagner subsp. *curtum* (Ewan) D.H. Wagner Canyon sword fern

EQUISETACEAE/Horsetail Family
Equisetum arvense L. Common horsetail
Equisetum hymale L. subsp. *affine* (Engelm.) Calder & R.L. Taylor
Equisetum laevigatum A. Braun
Equisetum telematela Ehrh. subsp. *braunii* (Milde) R.L. Hauke

ISOETACEAE/Quillwort Family
Isoetes howellii Engelm. Corte Madera Ranch
Isoetes nuttallii Engelm. Cuyamaca Peak
Isoetes orcuttii A.A. Eaton Corte Madera Ranch

MARSILEACEAE/Marsilea Family
Marsilea vestita Hook. & Grev. subsp. *vestita* Hairy cloverfern
Pilularia americana A. Braun American pillwort

POLYPODIACEAE/Polypody Family
Polypodium californicum Kaulf. California polypody

PTERIDACEAE/Brake Family
Adiantum jordanii C. Mueller California maidenhair
Aspidotis californica (Hook.) Copel. California lacefern
Aspidotis densa (Brackener) Lellinger Cuyamaca Peak; Lacefern
Cheilanthes clevelandii D. Eaton Cleveland's lipfern
Cheilanthes covillei Maxon Coville's lipfern
Pellaea andromedifolia (Kaulf.) Fee Coffee fern
Pellaea mucronata (D. Eaton) D. Eaton var. *mucronata*
Pentagramma triangularis (Kaulf.) G. Yatskievych, Windham, & Wollenweber subsp. *triangularis* Goldenback fern

SELAGINELLACEAE/Clubmoss Family
Selaginella asprella Maxon Bluish mossfern
Selaginella bigelovii L. Underw. Bigelow's mossfern

GYMNOSPERMAE/CONE-BEARING PLANTS

CUPRESSACEAE/Cypress Family
^{t}*Calocedrus decurrens* (Torrey) Florin Incense cedar
^{t}*Cupressus arizonica* E. Greene subsp. *arizonica* [*C. stephensonii* C. Wolf] Cuyamaca cypress
^{t}*Cupressus forbesii* Jepson Tecate cypress
^{t}*Juniperus californica* Carriere California juniper

EPHEDRACEAE/Ephedra Family
^{s}*Ephedra californica* S. Watson Thing Valley; Desert tea

PINACEAE/Pine Family
^{t}*Abies concolor* (Gordon & Glend.) Lindley White fir
^{t}*Pinus coulteri* D. Don Coulter pine
^{t}*Pinus jeffreyi* Grev. & Balf. Jeffrey pine
^{t}*Pinus lambertiana* Douglas Sugar pine
^{t}*Pinus monophylla* Torrey & Fremont Chariot and Indian canyons
^{t}*Pinus ponderosa* Laws. Ponderosa pine
^{t}*Pinus quadrifolia* Parl.
^{t}*Pseudotsuga macrocarpa* (Vasey) Mayr Big-cone Douglas fir

ANGIOSPERMAE/FLOWERING PLANTS

MONOCOTYLEDONES/MONOCOTS

ALISMATACEAE/Water-plantain Family
^{h}*Alisma plantago-aquatica* L. Julian and Wynola

CYPERACEAE/Sedge Family
^{h}*Carex alma* L. Bailey Sturdy sedge
^{h}*Carex globosa* Boott
^{h}*Carex multicaulis* L. Bailey
^{h}*Carex praegracilis* W. Boott
^{h}*Carex sartwelliana* Olney Cuyamaca Peak
^{h}*Carex senta* Boott
^{h}*Carex spissa* L. Bailey
^{h}*Carex subfusca* W. Boott
^{a}*Cyperus parishii* Britton Parish's umbrella-sedge
^{a}*Cyperus squarrosus* L.
^{a}*Eleocharis acicularis* (L.) Roemer & Schultes var. *bella* Piper
^{h}*Eleocharis macrostachya* Britton
^{h}*Eleocharis montevidensis* Kunth
^{h}*Eleocharis parishii* Britton
^{h}*Eleocharis pauciflora* (Light.) Link
^{h}*Scirpus acutus* Bigelow var. *occidentalis* (S. Watson) Beetle
^{h}*Scirpus americanus* Pers. American bulrush
^{h}*Scirpus microcarpus* C. Presl Small-fruit bulrush

IRIDACEAE/Iris Family
[h]*Iris missouriensis* Nutt. Rocky Mountain blue flag
[h]*Sisyrinchium bellum* S. Watson Blue-eyed-grass

JUNCACEAE/Rush Family
[a]*Juncus ambiguus* Guss.
[h]*Juncus balticus* Willd. Baltic rush
[a]*Juncus bryoides* F.J. Herm. One-flower dwarf rush
[a]*Juncus bufonius* L. var. *bufonius* Toad-rush
[a]*Juncus bufonius* L. var. *occidentalis* F.J. Herm.
[h]*Juncus dubius* Engelm. Mariposa rush
[h]*Juncus effusus* L. var. *pacificus* Fern. & Wieg.
[a]*Juncus luciensis* B. Ertter
[h]*Juncus macrophyllus* Cov.
[h]*Juncus mexicanus* Willd.
[h]*Juncus oxymeris* Engelm.
[h]*Juncus patens* E. Meyer
[h]*Juncus phaeocephalus* Engelm. var. *paniculatus* Engelm.
[h]*Juncus rugulosus* Engelm.
[h]*Juncus tenuis* Willd.
[a]*Juncus tiehmii* B. Ertter
[h]*Juncus torreyi* Cov.
[h]*Juncus xiphioides* E. Meyer
[h]*Luzula comosa* E. Meyer Cuyamaca Peak; Hairy wood-rush

JUNCAGINACEAE/Arrowgrass Family
[a]*Lilaea scilloides* (Poiret) Hauman Flowering quillwort

LEMNACEAE/Duckweed Family
[h]*Lemna minor* L. Lesser duckweed
[h]*Lemna minuscula* Herter Least duckweed

LILIACEAE/Lily Family
[g]*Allium amplectens* Torrey Paper onion
[g]*Allium campanulatum* S. Watson Sierra onion
[g]*Allium fimbriatum* S. Watson var. *fimbriatum* Desert onion
[g]*Allium haematochiton* S. Watson Red-skin onion
[g]*Allium parryi* S. Watson Cuyamaca Lake, Filaree Flat
[g]*Allium peninsulare* Lemmon var. *peninsulare* Red-flower onion
[u]*Asphodelus fistulosus*[*] L. Descanso; Hollow-stem asphodel
[g]*Bloomeria crocea* (Torrey) Cov. Common goldenstar
[g]*Brodiaea orcuttii* (E. Greene) Baker Orcutt's brodiaea
[g]*Brodiaea terrestris* Kellogg subsp. *kernensis* (Hoover) T. Niehaus
[g]*Calochortus albus* Benth. Fairy lantern
[g]*Calochortus concolor* (Baker) Purdy Golden-bowl mariposa lily
[g]*Calochortus dunnii* Purdy Dunn's mariposa lily
[g]*Calochortus invenustus* E. Greene
[g]*Calochortus splendens* Benth. Lilac mariposa lily
[g]*Calochortus weedii* Alph. Wood var. *weedii*
[g]*Chlorogalum parviflorum* S. Watson Poser and Viejas mountains
[g]*Dichelostemma capitatum* Alph. Wood subsp. *capitatum*

[g]*Fritillaria biflora* Lindley var. *biflora* Viejas Mountain
[g]*Lilium humboldtii* Roezl & Leichtlin subsp. *ocellatum* (Kellogg) Thorne Ocellated tiger lily
[g]*Lilium pardalinum* Kellogg subsp. *pardalinum* Leopard lily
[g]*Muilla maritima* (Torrey) S. Watson Poser Mountain
[h]*Nolina cismontana* Dice. Viejas Mountain
[h]*Nolina parryi* S. Watson Parry's bear-grass
[h]*Smilacina stellata* (L.) Desf. False Solomon's seal
[s]*Yucca schidigera* K.E. Ortgies Spanish dagger
[h]*Yucca whipplei* Torrey Whipple's yucca
[g]*Zigadenus fremontii* (Torrey) S. Watson Viejas Mountain
[g]*Zigadenus venenosus* S. Watson var. *venenosus* Death camas

ORCHIDACEAE/Orchid Family
[h]*Corallorhiza maculata* Raf. Spotted coralroot
[h]*Epipactis gigantea* Hook. Giant stream orchid
[h]*Piperia elongata* Rydb. Cuyamaca RSP
[h]*Piperia leptopetala* Rydb. Cuyamaca RSP
[h]*Piperia transversa* Suksd. Cuyamaca RSP
[h]*Piperia unalascensis* (Sprengel) Rydb. Cuyamaca RSP
[h]*Platanthera leucostachys* Lindley Cuyamaca RSP
[h]*Spiranthes porrifolia* Lindley Ladies' tresses

POACEAE/GRAMINEAE/Grass Family
[h]*Achnatherum coronatum* (Thurber) Barkworth Giant needlegrass
[h]*Achnatherum hymenoides* (Roemer & Schultes) Barkworth
[h]*Achnatherum lemmonii* (Vasey) Barkworth Lemmon's needlegrass
[h]*Achnatherum occidentalis* (Thurber) Barkworth subsp. *californicum* (Merr. & Burtt Davy) Barkworth Cuyamaca RSP
[h]*Achnatherum occidentalis* (Thurber) Barkworth subsp. *occidentalis* Laguna Mountains
[h]*Achnatherum speciosum* (Trin. & Rupr.) Barkworth
[h]*Agrostis exarata* Trin. Spike bentgrass
[h]*Agrostis pallens* Trin. Leafy bentgrass
[h]*Agrostis scabra* Willd. Rough bentgrass
[h]*Agrostis stolonifera** L. Creeping bentgrass
[h]*Agrostis viridis** Gouan Water bentgrass
[a]*Aira caryophyllea** L. Silver hairgrass
[h]*Alopecurus aequalis* Sobol. Short-awn foxtail
[a]*Alopecurus carolinianus* Walter Carolina foxtail
[a]*Alopecurus saccatus* Vasey Pacific foxtail
[a]*Aristida adscensionis* L. Viejas Mountain
[h]*Aristida purpurea* Nutt. var. *longiseta* (Steudel) Vasey
[h]*Aristida purpurea* Nutt. var. *nealleyi* (Vasey) K.W. Allred
[h]*Aristida purpurea* Nutt. var. *purpurea* Viejas Mountain
[a]*Avena barbata** Link Slender wild oat
[a]*Avena fatua** L.
[a]*Avena sativa** L. Cultivated oat
[h]*Bothriochloa barbinodis* (Lag.) Herter Viejas Mountain
[a]*Bouteloua barbata* Lag. var. *barbata* Six-weeks grama
[h]*Bouteloua curtipendula* (Michaux) Torrey Side-oats grama

^{a}*Briza minor** L. Corte Madera Ranch; Little quaking-grass
^{a}*Bromus arenarius** Labill. Australian chess
^{h}*Bromus carinatus* Hook. & Arn. var. *carinatus* California brome
^{a}*Bromus diandrus** Roth Ripgut brome
^{h}*Bromus grandis* (Shear) A. Hitchc. Grand brome
^{a}*Bromus hordeaceus** L. Smooth brome
^{a}*Bromus japonicus** Murr. Japanese brome
^{a}*Bromus madritensis* L. subsp. *rubens** (L.) Husnot Red brome
^{h}*Bromus orcuttianus* (Shear) A. Hitchc. Orcutt's brome
^{a}*Bromus tectorum** L. Cheat-grass brome
^{a}*Bromus trinii** Desv. Chilean chess
^{h}*Calamagrostis koelerioides* Vasey Dense reedgrass
^{a}*Crypsis vaginiflora** (Forsskal) Opiz
^{h}*Cynodon dactylon** (L.) Pers. Bermuda-grass
^{a}*Cynosurus echinatus** L. Santa Isabel, Stonewall Peak
^{h}*Dactylis glomerata** L. Orchardgrass
^{h}*Danthonia californica* Bolander var. *americana* (Scribner) A. Hitchc. California oatgrass
^{h}*Danthonia unispicata* (Thurber) Macoun One-spike oatgrass
^{a}*Deschampsia danthonioides* (Trin.) Benth. Hairgrass
^{h}*Deschampsia elongata* (Hook.) Benth. Slender hairgrass
^{h}*Distichlis spicata* (L.) E. Greene Salt-grass
^{h}*Elymus elymoides* (Raf.) Swezey subsp. *brevifolius* (J.G. Smith) Barkworth
^{h}*Elymus glaucus* Buckley subsp. *glaucus* Blue rye
^{h}*Elymus glaucus* Buckley subsp. *jepsonii* (Burtt Davy) Gould
^{h}*Elymus glaucus* Buckley subsp. *virescens* (Piper) Gould
^{h}*Elymus multisetus* (J.G. Smith) Burtt Davy
^{h}*Elymus trachycaulus* (Link) Shinners subsp. *trachycaulus*
^{h}*Elytrigia intermedia* (Host) Nevski subsp. *intermedia**
^{h}*Elytrigia pontica* (Podp.) Holub. subsp. *pontica**
^{a}*Eragrostis curvula* (Shrader) Nees var. *conferta** Nees Descanso
^{a}*Eragrostis minor** Host
^{h}*Festuca occidentalis* Hook. Western fescue
^{h}*Festuca rubra* L. Red fuscue
^{a}*Gastridium ventricosum** (Gouan) Schinz & Thell. Nitgrass
^{h}*Holcus lanatus** L. Creeping velvet-grass
^{h}*Hordeum brachyantherum* Nevski subsp. *brachyantherum*
^{h}*Hordeum brachyantherum* Nevski subsp. *californicum* (Covas & Stebb.) V. Bothmer, N. Jacobsen, & O. Seberg
^{a}*Hordeum jubatum* L.
^{a}*Hordeum marinum* Hudson subsp. *gussoneanum** (Parl.) Thell.
^{a}*Hordeum murinum* L. subsp. *glaucum** (Steudel) Tzvelev
^{a}*Hordeum murinum* L. subsp. *leporinum** (Link) Arcang.
^{a}*Hordeum vulgare** L. Cultivated barley
^{h}*Koeleria macrantha* (Ledeb.) J.A. Schultes Junegrass
^{a}*Lamarckia aurea** (L.) Moench Golden-top
^{h}*Leymus × multiflorus* (Gould) Barkworth & D.R. Dewey
^{h}*Leymus triticoides* (Buckley) Pilger Beardless rye
^{h}*Lolium perenne** L. Perennial ryegrass
^{a}*Lolium temulentum** L. Milk Ranch Road (UCR)
^{h}*Melica frutescens* Scribner Tall melic

[h]_Melica imperfecta_ Trin.
[h]_Muhlenbergia asperifolia_ (Nees & Meyen) L. Parodi
[a]_Muhlenbergia microsperma_ (DC.) Kunth Little muhly
[h]_Muhlenbergia richardsonis_ (Trin.) Rydb. Mat muhly
[h]_Muhlenbergia rigens_ (Benth.) A. Hitchc. Deergrass
[h]_Nasella cernua_ (Stebb. & Love) Barkworth East Mesa
[h]_Nasella lepida_ (A. Hitchc.) Barkworth Foothill needlegrass
[h]_Nasella pulchra_ (A. Hitchc.) Barkworth Purple needlegrass
[h]_Panicum acuminatum_ Sw. var. _acuminatum_ Pacific witchgrass
[a]_Panicum capillare_ L. Common witchgrass
[h]_Paspalum distichum_ L. Common knotgrass
[h]_Pennisetum setaceum_* Forsskal
[h]_Phalaris aquatica_* L. Harding grass
[h]_Phalaris arundinacea_* L. Big Laguna Lake; Reed canary grass
[a]_Phalaris minor_* Retz Little-seed canary grass
[h]_Phleum pratense_* L. Timothy
[h]_Piptatherum miliaceum_* (L.) Cosson Smilo
[a]_Poa annua_* L. Annual bluegrass
[h]_Poa atropurpurea_ Scribner Laguna and Corte Madera mountains
[h]_Poa bulbosa_* L. Bulbous bluegrass
[h]_Poa compressa_* L. Canada bluegrass
[a]_Poa howellii_ Vasey & Scribner Cuyamaca RSP
[h]_Poa pratensis_ L. subsp. _pratensis_* Kentucky bluegrass
[h]_Poa secunda_ J.S. Presl subsp. _secunda_ Malpais bluegrass
[a]_Polypogon interruptus_* Kunth Ditch beardgrass
[a]_Polypogon monspeliensis_* (L.) Desf. Rabbit-foot grass
[a]_Schismus barbatus_* (L.) Thell.
[a]_Secale cereale_* L. Descanso; Common rye
[h]_Sorghum halepense_* (L.) Pers. Johnson grass
[h]_Sphenopholis obtusata_ (Michaux) Scribner Cuyamaca Mountains
[h]_Sporobolus airoides_ (Torrey) Torrey Corte Madera Ranch
[h]_Sporobolus cryptandrus_ (Torrey) A. Gray Sand dropseed
[a]_Triticum aestivum_* L. Laguna Lakes; Cereal wheat
[a]_Vulpia bromoides_* (L.) S.F. Gray
[a]_Vulpia microstachys_ (Nutt.) Benth. var. _ciliata_ (Beal) Lonard & Gould
[a]_Vulpia microstachys_ (Nutt.) Benth. var. _confusa_ (Piper) Lonard & Gould
[a]_Vulpia microstachys_ (Nutt.) Benth. var. _pauciflora_ (Beal) Lonard & Gould
[a]_Vulpia myuros_ (L.) C. Gmelin var. _hirsuta_* (Hackell) Asch. & Graebner
[a]_Vulpia octoflora_ (Walter) Rydb. var. _hirtella_ (Piper) Henrad
[a]_Vulpia octoflora_ (Walter) Rydb. var. _octoflora_

POTAMOGETONACEAE/Pondweed Family
[h]_Potamogeton foliosus_ Raf. var. _foliosus_ Leafy pondweed
[h]_Potamogeton illinoensis_ Morong Shining pondweed
[h]_Potamogeton nodosus_ Poiret Long-leaf pondweed
[h]_Potamogeton pectinatus_ L. Fennel-leaf pondweed
[h]_Potamogeton pusillus_ L. var. _pusillus_ Small pondweed

TYPHACEAE/Cat-tail Family
[h]_Typha domingensis_ Pers. Tule cat-tail
[h]_Typha latifolia_ L. Soft flag

ZANNICHELLIACEAE/ Horned pondweed Family

[h]*Zannichellia palustris* L. Horned pondweed

DICOTYLEDONES/DICOTS

ACERACEAE/Maple Family

[t]*Acer macrophyllum* Pursh Big-leaf maple

AIZOACEAE/Carpetweed Family

[a]*Cypselea humifusa*[*] Turpin

AMARANTHACEAE/Amaranth Family

[a]*Amaranthus albus*[*] L. White tumbleweed
[a]*Amaranthus blitoides* S. Watson Prostrate amaranth
[a]*Amaranthus californicus* (Moq.) S. Watson
[a]*Amaranthus retroflexus*[*] L.

ANACARDIACEAE/Sumac Family

[s]*Malosma laurina* (Nutt.) Abrams Laurel sumac
[s]*Rhus ovata* S. Watson Sugar bush
[s]*Rhus trilobata* Torrey & A. Gray Basket bush
[s]*Toxicodendron diversilobum* (Torrey & A. Gray) E. Greene

APIACEAE/UMBELLIFERAE/Carrot Family

[h]*Angelica tomentosa* S. Watson
[u]*Anthriscus caucalis*[*] M. Bieb. Cuyamaca Lake
[a]*Apiastrum angustifolium* Nutt. Mock parsley
[u]*Apium graveolens*[*] L. Wild celery
[h]*Berula erecta* (Hudson) Cov. Cut-leaf water parsnip
[u]*Bowlesia incana* Ruiz Lopez & Pavon Corte Madera Ranch
[h]*Cicuta douglasii* (DC.) J. Coulter & Rose Water-hemlock
[u]*Conium maculatum*[*] L. Mount Laguna; Poison hemlock
[h]*Daucus carota*[*] L. Wild carrot
[a]*Daucus pusillus* Michaux Rattlesnake weed
[h]*Hydrocotyle ranunculoides*[*] L.*f.* Marsh pennywort
[h]*Lomatium dasycarpum* (Torrey & A. Gray) J. Coulter & Rose subsp. *dasycarpum* Bladder parsnip
[h]*Lomatium lucidum* (Torrey & A. Gray) Jepson Shiny lomatium
[h]*Oenanthe sarmentosa* J.S. Presl Pacific oenanthe
[h]*Osmorhiza brachypoda* Torrey California sweet-cicely
[h]*Osmorhiza chilensis* Hook. & Arn. Mountain sweet-cicely
[h]*Pastinaca sativa*[*] L. Common parsnip
[h]*Perideridia parishii* (J. Coulter & Rose) Nelson & J.F. Macbr. subsp. *latifolia* (A. Gray) Chuang & Constance
[h]*Sanicula arguta* J. Coulter & Rose Sharp-tooth sanicle
[h]*Sanicula bipinnatifida* Hook. Purple sanicle
[h]*Sanicula crassicaulis* DC. Pacific sanicle
[h]*Sanicula graveolens* DC. Sierra sanicle
[h]*Sanicula tuberosa* Torrey Turkey-pea sanicle

^{h}*Tauschia arguta* (Torrey & A. Gray) J.F. Macbr.
^{h}*Tauschia parishii* (J. Coulter & Rose) J.F. Macbr.
^{a}*Torilis arvensis** (Hudson) Link. Cuyamaca RSP
^{a}*Yabea microcarpa* (Hook. & Arn.) Koso-Polj.

APOCYNACEAE/Dogbane Family
^{c}*Apocynum androsaemifolium* L.
^{h}*Apocynum cannabinum* L. Indian hemp

ASCLEPIADACEAE/Milkweed Family
^{h}*Asclepias californica* E. Greene Woolly milkweed
^{h}*Asclepias eriocarpa* Benth. Indian milkweed
^{h}*Asclepias erosa* Torrey Desert milkweed
^{h}*Asclepias fascicularis* Decne. Narrow-leaf milkweed

ASTERACAE/COMPOSITAE/Aster Family
^{h}*Achillea filipendulina** Lam. Pine Hills; Fern-leaf yarrow
^{h}*Achillea millefolium* L. Yarrow
^{h}*Acourtia microcephala* DC. Scapellote
^{h}*Agoseris grandiflora* (Nutt.) E. Greene
^{a}*Agoseris heterophylla* (Nutt.) E. Greene
^{h}*Agoseris retrorsa* (Benth.) E. Greene
^{a}*Ambrosia acanthicarpa* Hook. Annual bur-weed
^{s}*Ambrosia dumosa* (A. Gray) Payne White bur-sage
^{h}*Ambrosia psilostachya* DC. Western ragweed
^{a}*Anisocoma acaulis* Torrey & A. Gray Scale-bud
^{a}*Anthemis cotula** L. Mayweed
^{s}*Artemisia californica* Less. Coastal sagebrush
^{h}*Artemisia douglasiana* Besser Douglas mugwort
^{h}*Artemisia dracunculus* L. Tarragon
^{s}*Artemisia ludoviciana* Nutt. subsp. *albula* (Wooton) Keck
^{s}*Artemisia ludoviciana* Nutt. subsp. *ludoviciana* Common mugwort
^{s}*Artemisia tridentata* Nutt. subsp. *tridentata*
^{h}*Aster bernardinus* H.M. Hall San Bernardino aster
^{h}*Aster chilensis* Nees Chile aster
^{s}*Baccharis salicifolia* (Ruiz Lopez & Pavon) Pers. Mule-fat
^{s}*Baccharis sarothroides* A. Gray Descanso; Broom baccharis
^{s}*Baccharis sergiloides* A. Gray Squaw waterweed
^{a}*Bidens pilosa* L. var. *pilosa** Beggar's tick
^{a}*Blennosperma nanum* (Hook.) S.F. Blake var. *nanum*
^{s}*Brickellia californica* (Torrey & A. Gray) A. Gray
^{a}*Centaurea maculosa** Lam. Julian; Spotted knapweed
^{a}*Centaurea melitensis** L. Tocalote
^{a}*Centaurea solstitialis** L. Yellow star-thistle
^{a}*Chaenactis artemisiifolia* (A. Gray) A. Gray
^{a}*Chaenactis glabriuscula* DC. var. *glabriuscula* Golden curls
^{a}*Chaenactis glabriuscula* DC. var. *lanosa* (DC.) H.M. Hall
^{c}*Chaenactis parishii* A. Gray Parish's pincushion
^{a}*Chamomilla suaveloens** (Pursh) Rydb. Pineapple weed
^{s}*Chrysothamnus nauseosus* (Pallas) Britton subsp. *bernardinus* (H.M. Hall) H.M. Hall & Clements Gravelly clay soils, Cuyamaca Peak; Rabbit brush

[s]*Chrysothamnus nauseosus* (Pallas) Britton subsp. *consimilis* (E. Greene) H.M. Hall & Clements
[h]*Cichorium intybus** L. Mediterranean chicory
[h]*Cirsium occidentale* (Nutt.) Jepson var. *californicum* (A. Gray) Keil & C. Turner
[h]*Cirsium scariosum* Nutt. Bird's nest thistle
[a]*Cnicus benedictus** L. Blessed thistle
[a]*Conyza canadensis** (L.) Cronq. Horseweed
[a]*Coreopsis californica* (Nutt.) H. Sharsm. var. *californica*
[s]*Ericameria brachylepis* (A. Gray) H.M. Hall
[c]*Ericameria cuneata* (A. Gray) McClatchie var. *macrocephala* Urb.
[s]*Ericameria linearifolia* (DC.) Urb. & J. Wussow
[s]*Ericameria parishii* (E. Greene) H.M. Hall var. *parishii*
[s]*Ericameria pinifolia* (A. Gray) H.M. Hall
[a]*Erigeron divergens* Torrey & A. Gray Diffuse daisy
[h]*Erigeron foliosus* Nutt. var. *foliosus* Fleabane
[c]*Eriophyllum confertiflorum* (DC.) A. Gray var. *confertiflorum*
[a]*Eriophyllum wallacei* (A. Gray) A. Gray Wallace's woolly-daisy
[h]*Euthamia occidentalis* Nutt. Western goldenrod
[a]*Filago arizonica* A. Gray Poser and Viejas mountains (RSA-POM)
[a]*Filago californica* Nutt. California filago
[a]*Filago gallica** L. Narrow-leaf filago
[h]*Geraea viscida* (A. Gray) S.F. Blake Sticky geraea
[u]*Gnaphalium californicum* DC. Green everlasting
[h]*Gnaphalium canescens* DC. subsp. *beneolens* (Davidson) Stebb. & Keil
[h]*Gnaphalium canescens* DC. subsp. *microcephalum* (Nutt.) Stebb. & Keil
[a]*Gnaphalium palustre* Nutt. Lowland cudweed
[u]*Gnaphalium stramineum* Kunth Cotton-batting plant
[h]*Grindelia hirsutula* Hook. & Arn. var. *hallii* (Steyerm.) M.A. Lane
[c]*Gutierrezia microcephala* (DC.) A. Gray Small-headed matchweed
[c]*Gutierrezia sarothrae* (Pursh) Britton & Rusby Broom matchweed
[s]*Hazardia squarrosa* (Hook. & Arn.) E. Greene var. *grindelioides* (DC.) W. Clark Saw-tooth goldenbush
[u]*Helenium puberulum* DC. Sneezeweed
[h]*Helianthella californica* A. Gray var. *nevadensis* (E. Greene) Jepson Near summit of Volcan Mountain
[a]*Helianthus annuus** L. Western sunflower
[h]*Helianthus californicus* DC. California sunflower
[h]*Helianthus gracilentus* A. Gray Slender sunflower
[a]*Hemizonia fasciculata* (DC.) Torrey & A. Gray Golden tarweed
[u]*Heterotheca grandiflora* Nutt. Telegraph weed
[s]*Heterotheca sessiliflora* (Nutt.) Shinners subsp. echioides (Benth.) Semple
[h]*Hieracium albiflorum* Hook. White hawkweed
[h]*Hieracium argutum* Nutt. Golden hawkweed
[h]*Hulsea californica* Torrey & A. Gray San Diego hulsea
[h]*Hymenopappus filifolius* Hook. var. *lugens* (E. Greene) Jepson
[h]*Hymenothrix wrightii* A. Gray Wright's hymenothrix
[a]*Hypochaeris glabra** L. Smooth cat's ear
[s]*Isocoma menziesii* (Hook. & Arn.) Nesom var. *menziesii*
[a]*Lactuca serriola** L. Prickly lettuce
[a]*Lagophylla ramosissima* Nutt. subsp. *ramosissima* Common hareleaf
[a]*Lasthenia californica* Lindley California goldfields

[a]*Lasthenia glaberrima* A.DC. Corte Madera and Cuyamaca lakes
[a]*Layia glandulosa* (Hook.) Hook. & Arn. White tidy-tips
[a]*Layia platyglossa* Fischer & C. Meyer Meadow tidy-tips
[h]*Lessingia filaginifolia* (Hook. & Arn.) M.A. Lane var. *filaginifolia* Mountain cudweed
[a]*Lessingia glandulifera* A. Gray var. *glandulifera*
[h]*Machaeranthera asteroides* (Torrey) E. Greene var. *lagunensis* (Keck) B. Turner Laguna aster
[u]*Machaeranthera canescens* (Pursh) A. Gray var. *canescens*
[h]*Machaeranthera juncea* (E. Greene) Shinners Poser Mountain
[a]*Madia elegans* Lindley subsp. *elegans* Elegant madia
[a]*Madia exigua* (Smith) A. Gray Pygmy madia
[a]*Madia gracilis* (Smith) Keck Slender madia
[a]*Madia minima* (A. Gray) Keck Small madia
[a]*Malacothrix clevelandii* A. Gray
[a]*Micropus californicus* Fischer & C. Meyer
[a]*Microseris douglasii* (DC.) Schultz-Bip. subsp. *platycarpha* (A. Gray) Chambers Viejas Mountain
[a]*Osmadenia tenella* Nutt. Rosinweed
[u]*Pectis papposa* Harvey & A. Gray var. *papposa* Cinchweed
[a]*Pentachaeta aurea* Nutt. Golden daisy
[u]*Pluchea odorata* (L.) Cass. Salt-marsh fleabane
[a]*Psilocarphus brevissimus* Nutt. var. *brevissimus* Woolly marbles
[a]*Rafinesquia californica* Nutt. California chicory
[s]*Senecio flaccidus* Less. var. *douglasii* (DC.) B. Turner & T. Barkley Sand-wash butterweed
[h]*Solidago californica* Nutt. California goldenrod
[h]*Solidago confinis* Nutt. Marsh goldenrod
[a]*Sonchus asper** (L.) Hill subsp. *asper* Spiny sow thistle
[a]*Sonchus oleraceus** L. Common sow thistle
[a]*Stebbinoseris heterocarpa* (Nutt.) Chambers Viejas Mountain
[a]*Stephanomeria exigua* Nutt. subsp. *deanei* (J.F. Macbr.) Gottlieb
[a]*Stephanomeria virgata* Benth. subsp. *pleurocarpa* (E. Greene) Gottlieb Virgate stephanomeria
[a]*Stylocline gnaphalioides* Nutt. Everlasting nest-straw
[h]*Taraxacum officinale** Wigg. Common dandelion
[s]*Tetradymia canescens* DC. Monument Peak; Cotton-thorn
[s]*Tetradymia comosa* A. Gray
[a]*Tragopogon dubius** Scop. Goat's beard
[u]*Uropappus lindleyi* (DC.) Nutt. Silver puffs
[h]*Wyethia ovata* Torrey & A. Gray Mule's ears
[a]*Xanthium strumarium* L. Cocklebur

BERBERIDACEAE/Barberry Family
[s]*Berberis aquifolium* Pursh var. *dictyota* (Jepson) Jepson
[s]*Berberis aquifolium* Pursh var. *repens* (Lindley) H. Scoggan
[s]*Berberis pinnata* Lagasca subsp. *pinnata* Shiny-leaf barberry

BETULACEAE/Alder Family
[t]*Alnus rhombifolia* Nutt. White alder

BIGNONIACEAE/Bignonia Family
[t]_Chilopsis linearis_ (Cav.) Sweet subsp. _arcuata_ (Fosb.) Henrickson Desert willow

BORAGINACEAE/Borage Family
[a]_Amsinckia menziesii_ (Lehm.) Nelson & J.F. Macbr. var. _intermedia_ (Fischer & C. Meyer) Ganders
[a]_Cryptantha affinis_ (A. Gray) E. Greene Common cryptantha
[a]_Cryptantha barbigera_ (A. Gray) E. Greene
[a]_Cryptantha flaccida_ (Lehm.) E. Greene
[a]_Cryptantha intermedia_ (A. Gray) E. Greene Nievitas
[a]_Cryptantha micrantha_ (Torrey) I.M. Johnston
[a]_Cryptantha micromeres_ (A. Gray) E. Greene
[a]_Cryptantha microstachys_ (A. Gray) E. Greene
[a]_Cryptantha muricata_ (Hook. & Arn.) Nelson & J.F. Macbr.
[a]_Cryptantha simulans_ E. Greene
[a]_Harpagonella palmeri_ A. Gray Poser and Viejas mountains
[h]_Heliotropium curassavicum_ L. Salt heliotrope
[a]_Pectocarya penicillata_ (Hook. & Arn.) A.DC.
[a]_Pectocarya setosa_ A. Gray
[a]_Plagiobothrys arizonicus_ (A. Gray) A. Gray
[a]_Plagiobothrys bracteatus_ (J. Howell) I.M. Johnston
[a]_Plagiobothrys canescens_ Benth.
[a]_Plagiobothrys collinus_ (Philbr.) I.M. Johnston var. _fulvescens_ (I.M. Johnston) Higgins
[a]_Plagiobothrys hispidulus_ (E. Greene) I.M. Johnston
[h]_Plagiobothrys nothofulvus_ (A. Gray) A. Gray
[a]_Plagiobothrys tenellus_ (Nutt.) A. Gray
[a]_Plagiobothrys trachycarpus_ (A. Gray) I.M. Johnston

BRASSICACEAE/CRUCIFERAE/Mustard Family
[h]_Arabis glabra_ (L.) Benth. var. _glabra_* Tower mustard
[h]_Arabis holboellii_ Hornem. var. _pinetorum_ (Tidestrom) Rollins
[h]_Arabis perennans_ S. Watson Nevada rock-cress
[h]_Arabis pulchra_ M.E. Jones var. _graclis_ M.E. Jones
[h]_Arabis pulchra_ M.E. Jones var. _pulchra_ Beautiful rock-cress
[h]_Arabis sparsiflora_ Torrey & A. Gray var. _californica_ Rollins
[a]_Athysanus pusillus_ (Hook.) E. Greene
[h]_Barbarea orthoceras_ Ledeb. Erect-pod winter-cress
[a]_Brassica rapa_* L. Field mustard
[a]_Camelina microcarpa_* Andrz. Cuyamaca RSP; False flax
[a]_Capsella bursa-pastoris_* (L.) Medikus Shepherd's purse
[h]_Cardamine californica_ (Torrey & A. Gray) E. Greene var. _californica_ Milkmaids
[a]_Caulanthus heterophyllus_ (Nutt.) Payson var. _heterophyllus_ [_C. stenocarpus_ Payson] Poser Mountain
[a]_Caulanthus simulans_ Payson Garnet Mountain
[h]_Descurainia incana_ (Fischer & C. Meyer) Dorn
[a]_Descurainia pinnata_ (Walter) Britton subsp. _glabra_ (Wooton & Standley) Detl.
[a]_Descurainia pinnata_ (Walter) Britton subsp. _halictorum_ (Cockerell) Detl.
[a]_Descurainia pinnata_ (Walter) Britton subsp. _menziesii_ (DC.) Detl.
[u]_Descurainia sophia_* (L.) Webb Fine-leaf tansy-mustard
[a]_Draba cuneifolia_ Torrey & A. Gray Desert whitlow

[a]_Draba verna_ L. Vernal whitlow
[h]_Erysimum capitatum_ (Douglas) E. Greene subsp. _capitatum_
[a]_Guillenia lasiophylla_ (Hook. & Arn.) E. Greene
[h]_Hirschfeldia incana_* (L.) Lagr.-Fossat Short-pod mustard
[u]_Lepidium campestre_* (L.) R.Br.
[a]_Lepidium lasiocarpum_ Torrey & A. Gray var. _lasiocarpum_
[a]_Lepidium nitidum_ Torrey & A. Gray var. _nitidum_
[u]_Lepidium perfoliatum_* L. Laguna Mountains
[a]_Lepidium virginicum_ L. var. _pubescens_ (E. Greene) Thell.
[u]_Raphanus raphanistrum_* L. Mount Laguna; Jointed charlock
[u]_Rorippa curvisiliqua_ (Hook.) Britton Prostrate yellow-cress
[h]_Rorippa nasturtium-aquaticum_* (L.) Hayek White water-cress
[h]_Rorippa sinuata_ (Torrey & A. Gray) A. Hitchc.
[a]_Rorippa tenerrima_ E. Greene Lyrate-leaf yellow-cress
[a]_Sisymbrium altissimum_* L. Tall rocket
[a]_Sisymbrium officinale_* L. Tumble mustard
[c]_Streptanthus bernardinus_ (E. Greene) Parish Laguna jewelflower
[c]_Streptanthus campestris_ S. Watson Southern jewelflower
[a]_Thlaspi arvense_* L. Corte Madera Ranch; Penny-cress
[a]_Thysanocarpus curvipes_ Hook. Lacepod
[a]_Thysanocarpus laciniatus_ Torrey & A. Gray Fringepod
[a]_Tropidocarpum gracile_ Hook. Descanso; Slender dobie-pod

CACTACEAE/Cactus Family
[s]_Echinocereus engelmannii_ (Engelm.) Lemaire Engelmann hedgehog
[s]_Opuntia basilaris_ Engelm. & J. Bigelow var. _basilaris_
[s]_Opuntia chlorotica_ (Engelm.) J. Bigelow Pancake pear
[s]_Opuntia parryi_ Engelm. Cane cholla
[s]_Opuntia phaeacantha_ Engelm. Engelmann prickly-pear
[s]_Opuntia_ × _vaseyi_ (J. Coulter) Britton & Rose Vasey pear

CALLITRICHACEAE/Water-starwort Family
[a]_Callitriche heterophylla_ Pursh var. _bolanderi_ (Hegelm.) Fassett
[a]_Callitriche marginata_ Torrey
[a]_Callitriche verna_ L.

CAMPANULACEAE/Bell-flower Family
[a]_Downingia concolor_ E. Greene var. _brevior_ McVaugh
[a]_Githopsis diffusa_ A. Gray subsp. _candida_ (Ewan) N. Morin
[a]_Githopsis diffusa_ A. Gray subsp. _filicaulis_ (Ewan) N. Morin
[a]_Heterocodon rariflorum_ Nutt.
[h]_Lobelia cardinalis_ L. var. _pseudosplendens_ McVaugh
[h]_Lobelia dunnii_ E. Greene var. _serrata_ (A. Gray) McVaugh
[a]_Nemacladus longiflorus_ A. Gray var. _longiflorus_
[a]_Nemacladus pinnatifidus_ E. Greene
[a]_Nemacladus ramosissimus_ Nutt.
[a]_Triodanis biflora_ (Ruiz Lopez & Pavon) E. Greene

CAPRIFOLIACEAE/Honeysuckle Family
[s]_Lonicera subspicata_ Hook. & Arn. var. _denudata_ Rehder
[s]_Sambucus mexicana_ C. Presl Blue elderberry

[s]*Symphoricarpos mollis* Nutt. Spreading snowberry
[s]*Symphoricarpos rotundifolius* A. Gray var. *parishii* (Rydb.) Dempster Parish's snowberry

CARYOPHYLLACEAE/Pink Family
[h]*Cerastium fontanum* Baumg. subsp. *vulgare** (Hartman) Greuter & Burdet Mouse-ear chickweed
[a]*Cerastium glomeratum** Thuill.
[a]*Dianthus armeria* L. subsp. *armeria** Volcan Mountain
[a]*Loeflingia squarrosa* (Nutt.) var. *squarrosa* Poser Mountain
[a]*Minuartia douglasii* (Torrey & A. Gray) Mattf. Sandwort
[a]*Minuartia pusilla* (S. Watson) Mattf. Little sandwort
[c]*Moehringia macrophylla* (Hook.) Fenzl
[a]*Sagina decumbens* (Elliot) Torrey & A. Gray subsp. *occidentalis* (S. Watson) G. Crow Pearlwort
[h]*Saponaria officinalis** L. Bouncing bet
[a]*Silene antirrhina* L. Snapdragon catchfly
[a]*Silene armeria** L.
[a]*Silene gallica** L. Windmill pink
[h]*Silene laciniata* Cav. subsp. *major* C. Hitchc. & Maguire
[h]*Silene lemmonii* S. Watson Lemmon's pink
[a]*Silene multinervia* S. Watson Poser Mountain
[h]*Silene verecunda* S. Watson subsp. *platyota* (S. Watson) C. Hitchc. & Maguire
[a]*Stellaria media** (L.) Villars Common chickweed
[a]*Stellaria nitens* Nutt. Shiny chickweed

CELASTRACEAE/Staff-tree Family
[s]*Euonymus occidentalis* Torrey var. *parishii* (Trel.) Jepson

CERATOPHYLLACEAE/Hornwort Family
[u]*Ceratophyllum demersum* L. Corte Madera Ranch; Hornwort

CHENOPODIACEAE/Goosefoot Family
[a]*Atriplex rosea** L. Redscale
[a]*Chenopodium album** L. White lamb's quarters
[a]*Chenopodium berlandieri* Moq.
[a]*Chenopodium californicum* (S. Watson) S. Watson
[a]*Chenopodium hians* Standley
[a]*Chenopodium incognitum* Wahl
[a]*Salsola tragus** L. Russian thistle

CISTACEAE/Rock-rose Family
[h]*Helianthemum scoparium* Nutt. Sun-rose

CONVOLVULACEAE/Morning-glory Family
[s]*Calystegia longipes* (S. Watson) Brummit Piute morning-glory
[h]*Calystegia macrostegia* (E. Greene) Brummit subsp. *arida* (E. Greene) Brummit
[h]*Calystegia occidentalis* (A. Gray) Brummit subsp. *fulcrata* (A. Gray) Brummit Sonora morning glory

CORNACEAE/Dogwood Family
^{s}*Cornus nuttallii* Audubon Pacific dogwood
^{s}*Cornus sericea* L. subsp. *occidentalis* (Torrey & A. Gray) Fosberg

CRASSULACEAE/Stonecrop Family
^{a}*Crassula aquatica* (L.) Schonl.
^{a}*Crassula connata* (Ruiz Lopez & Pavon) A. Berger Pygmy stonecrop
^{h}*Dudleya abramsii* Rose subsp. *abramsii* Abram's dudleya
^{h}*Dudleya edulis* (Nutt.) Moran Ladyfingers
^{h}*Dudleya lanceolata* (Nutt.) Britton & Rose
^{h}*Dudleya pulverulenta* (Nutt.) Britton & Rose subsp. *arizonica* (Rose) Moran Laguna dudleya
^{h}*Dudleya pulverulenta* (Nutt.) Britton & Rose subsp. *pulverulenta* Chalk dudleya
^{h}*Dudleya saxosa* (M.E. Jones) Britton & Rose subsp. *aloides* (Rose) Moran [*Dudleya alainae* Reiser]

CUCURBITACEAE/Gourd Family
^{u}*Cucurbita foetidissima* Kunth Calabazilla
^{h}*Marah macrocarpus* (E. Greene) E. Greene var. *macrocarpus* Wild cucumber

CUSCUTACEAE/Dodder Family
^{a}*Cuscuta californica* Hook. & Arn. var. *californica* Witch's hair
^{a}*Cuscuta indecora* Choisy var. *indecora*
^{a}*Cuscuta subinclusa* Durand & Hilg. Canyon dodder

DATISCACEAE/Durango Root Family
^{h}*Datisca glomerata* (C. Presl) Baillon Durango root

DIPSACACEAE/Teasel Family
^{h}*Scabiosa atropurpurea** L. Pincushions

ELATINACEAE/Waterwort Family
^{a}*Elatine brachysperma* A. Gray Corte Madera Ranch
^{a}*Elatine californica* A. Gray California waterwort

ERICACEAE/Manzanita Family
^{s}*Arctostaphylos glandulosa* Eastw. subsp. *adamsii* (Munz) Munz
^{s}*Arctostaphylos glandulosa* Eastw. subsp. *zacaensis* (Eastw.) P. Wells
^{s}*Arctostaphylos glauca* Lindley Big-berry manzanita
^{s}*Arctostaphylos pringlei* C. Parry subsp. *drupacea* (C. Parry) P. Wells Cuyamaca manzanita
^{s}*Arctostaphylos pungens* Kunth Mexican manzanita
^{h}*Pyrola picta* Smith Wintergreen
^{s}*Rhododendron occidentale* (Torrey & A. Gray) A. Gray
^{s}*Xylococcus bicolor* Nutt. Mission manzanita

EUPHORBIACEAE/Spurge Family
^{h}*Chamaesyce albomarginata* (Torrey & A. Gray) Small
^{a}*Chamaesyce maculata** (L.) Small Spotted spurge
^{a}*Chamaesyce micromera* (Engelm.) Wooton & Standley

[a]*Chamaesyce serpyllifolia* (Pers.) Small subsp. *hirtula* (S. Watson) Koutnik Pine sand-mat
[h]*Croton californicus* Muell. Arg. California croton
[a]*Eremocarpus setiger* (Hook.) Benth. Doveweed
[h]*Euphorbia palmeri* S. Watson Wood spurge
[a]*Euphorbia spathulata* Lam. Cuyamaca RSP

FABACEAE/LEGUMINOSAE/Pea Family
[s]*Acacia greggii* A. Gray Cat-claw acacia
[s]*Amorpha fruticosa* L. False indigo
[h]*Astragalus douglasii* (Torrey & A. Gray) A. Gray var. *parishii* (A. Gray) M.E. Jones
[a]*Astragalus gambelianus* E. Sheldon Poser Mountain
[s]*Astragalus oocarpus* A. Gray Descanso milkvetch
[u]*Astragalus palmeri* A. Gray Palmer's locoweed
[s]*Cercis occidentalis* Torrey Western redbud
[h]*Hoita macrostachya* (DC.) Rydb. Leather root
[h]*Hoita orbicularis* (Lindley) Rydb.
[h]*Lathyrus latifolius*[*] L.
[h]*Lathyrus vestitus* Nutt. var. *alefeldii* (T. White) Isley
[h]*Lotus argophyllus* (A. Gray) E. Greene var. *argophyllus*
[s]*Lotus crassifolius* (Benth.) E. Greene var. *crassifolius*
[h]*Lotus grandiflorus* (Benth.) E. Greene var. *grandiflorus*
[a]*Lotus hamatus* E. Greene
[h]*Lotus heermannii* (Durand & Hilg.) E. Greene var. *heermannii*
[a]*Lotus humistratus* E. Greene
[a]*Lotus micranthus* Benth.
[h]*Lotus nevadensis* (S. Watson) E. Greene var. *nevadensis*
[h]*Lotus oblongifolius* (Benth.) E. Greene var. *oblongifolius*
[a]*Lotus purshianus* (Benth.) Clements & E.G. Clements var. *purshianus* Spanish clover
[a]*Lotus salsuginosus* E. Greene var. *brevivexillus* Ottley
[a]*Lotus salsuginosus* E. Greene var. *salsuginosus*
[h]*Lotus scoparius* (Nutt.) Ottley var. *brevialatus* Ottley
[h]*Lotus scoparius* (Nutt.) Ottley var. *scoparius* Deerweed
[a]*Lotus strigosus* (Nutt.) E. Greene Bishop lotus
[a]*Lotus wrangelianus* Fischer & C. Meyer
[s]*Lupinus albifrons* Benth. var. *albifrons*
[a]*Lupinus bicolor* Lindley Dove lupine
[a]*Lupinus concinnus* J. Agardh
[s]*Lupinus excubitus* M.E. Jones var. *austromontanus* (A.A. Heller) C.P. Smith Grape soda lupine
[s]*Lupinus excubitus* M.E. Jones var. *hallii* (Abrams) C.P. Smith
[h]*Lupinus formosus* E. Greene var. *formosus*
[a]*Lupinus hirsutissimus* Benth. Stinging lupine
[h]*Lupinus latifolius* J. Agardh var. *parishii* C.P. Smith
[s]*Lupinus longifolius* (S. Watson) Abrams Mesa Grande
[a]*Lupinus microcarpus* Sims var. *densiflorus* (Benth.) Jepson
[a]*Lupinus sparsiflorus* Benth.
[a]*Lupinus truncatus* Hook. & Arn. Chaparral lupine
[a]*Medicago lupulina*[*] L. Black medick
[a]*Medicago polymorpha*[*] L. Toothed bur-clover

^{h}*Medicago sativa** L. Alfalfa
^{u}*Melilotus alba** Medikus White sweet-clover
^{a}*Melilotus indica** (L.) All. Indian sweet-clover
^{s}*Pickeringia montana* Nutt. var. *tomentosa* (Abrams) I.M. Johnston Corte Madera, Viejas Mountains
^{h}*Rupertia rigida* (Parish) Grimes Parish's rupertia
^{s}*Spartium junceum** L. Spanish broom
^{h}*Thermopsis macrophylla* Hook. & Arn. var. *semota* Jepson
^{a}*Trifolium albopurpureum* Torrey & A. Gray Rancheria clover
^{a}*Trifolium ciliolatum* Benth. Tree clover
^{a}*Trifolium depauperatum* Desv. var. *truncatum* (E. Greene) Isley
^{a}*Trifolium gracilentum* Torrey & A. Gray var. *gracilentum*
^{a}*Trifolium microcephalum* Pursh
^{a}*Trifolium obtusiflorum* Hook. & Arn. Creek clover
^{h}*Trifolium pratense** L. Red clover
^{u}*Trifolium variegatum* Nutt. White-tip clover
^{a}*Trifolium willdenovii* Sprengel Tom-cat clover
^{h}*Trifolium wormskioldii* Lehm. Cow clover
^{h}*Vicia americana* Willd. var. *americana* Sierra vetch
^{a}*Vicia hassei* S. Watson Slender vetch
^{a}*Vicia ludoviciana* Nutt. var. *ludoviciana*
^{a}*Vicia villosa* Roth subsp. *varia** (Host) Corbiere

FAGACEAE/Oak Family
^{t}*Quercus agrifolia* Nee var. *agrifolia* California live oak
^{t}*Quercus agrifolia* Nee var. *oxyadenia* (Torrey) J. Howell
^{t}*Quercus berberidifolia* Liebm. [*Q. dumosa* Nutt. misappl.]
^{t}*Quercus chysolepis* Liebm. Canyon oak
^{s}*Quercus cornelius-mulleri* K. Nixon & K. Steele
^{t}*Quercus engelmannii* E. Greene Mesa blue oak
^{t}*Quercus kelloggii* Newb. California black oak
^{s}*Quercus wislizenii* A.DC. var. *frutescens* Engelm.

GARRYACEAE/Silk-tassel Family
^{s}*Garrya flavescens* S. Watson Silk-tassel
^{s}*Garrya fremontii* Torrey
^{s}*Garrya veatchii* Kellogg

GENTIANACEAE/Gentian Family
^{a}*Centaurium exaltatum* (Griseb.) Piper Centaury
^{a}*Centaurium venustum* (A. Gray) Robinson Canchalagua
^{a}*Eustoma exaltatum* (L.) Don Desert gentian
^{a}*Swertia parryi* (Torrey) Kuntze Parry's green gentian

GERANIACEAE/Geranium Family
^{a}*Erodium botrys** (Cav.) Bertol. Long-beak filaree
^{a}*Erodium cicutarium** (L.) L'Her. Red-stem filaree
^{h}*Geranium californicum* G. Jones & F. Jones Agua Dulce Ravine
^{a}*Geranium carolinianum** L. Carolina geranium

GROSSULARIAEAE/Currant Family
^{s}*Ribes canthariforme* Wiggins Moreno currant
^{s}*Ribes indecorum* Eastw. Winter currant
^{s}*Ribes nevadense* Kellogg Sierra currant
^{s}*Ribes quercetorum* E. Greene Oak gooseberry
^{s}*Ribes roezlii* Regl. var. *roezlii*

HYDROPHYLLACEAE/Waterleaf Family
^{a}*Emmenanthe penduliflora* Benth. Whispering bells
^{s}*Eriodictyon trichocalyx* A.A. Heller var. *lanatum* (Brand) Jepson
^{a}*Eucrypta chrysanthemifolia* (Benth.) E. Greene var. *chrysanthemifolia*
^{a}*Nemophila menziesii* Hook. & Arn. var. *integrifolia* Parish
^{a}*Nemophila menziesii* Hook. & Arn. var. *menziesii*
^{a}*Nemophila pedunculata* Benth. Cuyamaca Lake
^{a}*Phacelia brachyloba* (Benth.) A. Gray
^{a}*Phacelia cicutaria* E. Greene var. *hispida* (A. Gray) J. Howell
^{a}*Phacelia curvipes* S. Watson
^{a}*Phacelia davidsonii* A. Gray
^{a}*Phacelia distans* Benth. Wild heliotrope
^{h}*Phacelia imbricata* E. Greene subsp. *imbricata*
^{h}*Phacelia imbricata* E. Greene subsp. *patula* (Brand) Heckard
^{a}*Phacelia parryi* Torrey
^{h}*Phacelia ramosissima* Lehm. var. *latifolia* (Torrey) Cronq.
^{s}*Turricula parryi* (A. Gray) J.F. Macbr. Poodle-dog bush

HYPERICACEAE/St. John's Wort Family
^{a}*Hypericum anagalloides* Cham. & Schldl. Tinker's penny
^{h}*Hypericum formosum* Kunth var. *scouleri* (Hook.) J. Coulter
^{h}*Hypericum perforatum** L. Klamath weed

LAMIACEAE/LABIATAE/Mint Family
^{a}*Acanthomintha ilicifolia* (A. Gray) A. Gray San Diego thornmint
^{a}*Lamium amplexicaule** L. Henbit
^{h}*Marrubium vulgare** L. Horehound
^{h}*Mentha arvensis* L. Tule mint
^{h}*Mentha × piperita** L. Corte Madera Ranch; Peppermint
^{h}*Mentha spicata* L. var. *spicata** Spearmint
^{c}*Monardella hypoleuca* A. Gray subsp. *lanata* (Abrams) Munz
^{a}*Monardella lanceolata* A. Gray Mustang mint
^{c}*Monardella linoides* A. Gray subsp. *linoides*
^{c}*Monardella macrantha* A. Gray Scarlet monardella
^{c}*Monardella nana* A. Gray subsp. *leptosiphon* (Torrey) Abrams
^{c}*Monardella nana* A. Gray subsp. *nana*
^{h}*Pycnanthemum californicum* Torrey Mountain mint
^{c}*Salvia apiana* Jepson White sage
^{s}*Salvia clevelandii* (A. Gray) E. Greene Fragrant sage
^{a}*Salvia columbariae* Benth. Chia
^{c}*Salvia sonomensis* E. Greene Viejas Mountain, Cuyamaca Peak
^{h}*Scutellaria bolanderi* A. Gray subsp. *austromontana* Epling
^{h}*Scutellaria tuberosa* Benth. Blue skullcap
^{h}*Stachys ajugoides* Benth. var. *rigida* Jepson & Hoover

^{a}*Trichostema austromontanum* Harlan Lewis subsp. *austromontanum*
^{a}*Trichostema lanceolatum* Benth. Vinegar weed
^{s}*Trichostema parishii* Vasey Mountain blue-curls

LAURACEAE/Laurel Family
^{t}*Umbellularia californica* (Hook. & Arn.) Nutt. California bay

LIMNANTHACEAE/Meadowfoam Family
^{a}*Limnanthes gracilis* Howell subsp. *parishii* (Jepson) Beauchamp

LINACEAE/Flax Family
^{a}*Hesperolinon micranthum* (A. Gray) Small Dwarf flax
^{h}*Linum lewisii* Pursh var. *lewisii* Blue flax

LOASACEAE/Stick-leaf Family
^{a}*Mentzelia affinis* E. Greene Blazing star
^{a}*Mentzelia montana* (Davidson) Davidson
^{a}*Mentzelia veatchiana* Kellogg

LYTHRACEAE/Loosestrife Family
^{h}*Lythrum californicum* Torrey & A. Gray
^{a}*Lythrum hyssopifolium** L. Grass poly

MALVACEAE/Mallow Family
^{s}*Malacothamnus densiflorus* (S. Watson) E. Greene Bushmallow
^{a}*Malva parviflora** L. Cheeseweed
^{h}*Sidalcea malvaeflora* (DC.) Benth. subsp. *sparsifolia* C. Hitchc.
^{h}*Sphaeralcea ambigua* A. Gray var. *rosacea* (Munz & I.M. Johnston) Kearney Mason Valley; Rose desert mallow

MELIACEAE
^{t}*Melia azedarach** L. Banner China berry

NELUMBONACEAE
^{h}*Nelumbo lutea** (Willd.) Pers. American water-lily

NYCTAGINACEAE/Four-o'clock Family
^{a}*Boerhavia intermedia* M.E. Jones Oriflamme
^{h}*Mirabilis californica* A. Gray Wishbone bush
^{h}*Mirabilis multiflora* (Torrey) A. Gray var. *pubescens* S. Watson

OLEACEAE/Olive Family
^{t}*Fraxinus velutina* Torrey Velvet ash

ONAGRACEAE/Evening Primrose Family
^{u}*Camissonia bistorta* (Torrey & A. Gray) Raven
^{a}*Camissonia californica* (Torrey & A. Gray) Raven False mustard
^{a}*Camissonia confusa* Raven
^{a}*Camissonia hirtella* (E. Greene) Raven
^{a}*Camissonia ignota* (Jepson) Raven
^{a}*Camissonia pallida* (Abrams) Raven subsp. *pallida*

^{a}*Camissonia strigulosa* (Fischer & C. Meyer) Raven
^{a}*Clarkia delicata* (Abrams) Nelson & J.F. Macbr. Corte Madera
^{a}*Clarkia purpurea* (Curtis) Nelson & J.F. Macbr. subsp. *quadrivulnera* (Douglas) Harlan Lewis & M. Lewis
^{a}*Clarkia rhomboidea* Douglas Diamond clarkia
^{a}*Clarkia similis* Harlan Lewis & Ernst Canyon clarkia
^{a}*Epilobium brachycarpum* C. Presl Summer cottonweed
^{c}*Epilobium canum* (E. Greene) Raven subsp. *canum*
^{c}*Epilobium canum* (E. Greene) Raven subsp. *latifolium* (Hook.) Raven
^{h}*Epilobium ciliatum* Raf. subsp. *ciliatum*
^{a}*Epilobium densiflorum* (Lindley) P. Hoch & Raven
^{a}*Epilobium minutum* Lehm. Gravelly clay soils, Cuyamaca Peak
^{a}*Epilobium pygmaeum* (Speg.) P. Hoch & Raven
^{h}*Gaura sinuata** Ser. Butterfly weed
^{a}*Gayophytum diffusum* Torrey & A. Gray subsp. *parviflorum* Harlan Lewis & J. Szweykowski
^{a}*Gayophytum humile* A.L. Juss. Cuyamaca Peak, Cuyamaca Lake
^{a}*Gayophytum oligospermum* Harlan Lewis & J. Szweykowski
^{h}*Ludwigia repens* Forster East of Ramona; Water primrose
^{h}*Oenothera californica* (S. Watson) S. Watson subsp. *californica*
^{h}*Oenothera elata* Kunth subsp. *hirsutissima* (S. Watson) W. Dietr.
^{h}*Oenothera elata* Kunth subsp. *hookeri* (Torrey & A. Gray) W. Dietr. & W.L. Wagner Anahuac School; Great yellow evening primrose

OROBANCHACEAE/Broom-rape Family
^{p}*Orobanche bulbosa* G. Beck Chaparral broom-rape
^{p}*Orobanche fasciculata* Nutt. Pine broom-rape
^{p}*Orobanche parishii* (Jepson) Heckard subsp. *parishii*

PAEONIACEAE/Peony Family
^{h}*Paeonia californica* Torrey & A. Gray California peony

PAPAVERACEAE/Poppy Family
^{u}*Argemone munita* Durand & Hilgard Prickly poppy
^{s}*Dendromecon rigida* Benth. Bush poppy
^{h}*Dicentra chrysantha* (Hook. & Arn.) Walp. Golden ear-drops
^{u}*Eschscholzia californica* Cham. California poppy
^{a}*Meconella californica* Torrey (Descanso, location doubtful)
^{a}*Meconella denticulata* E. Greene Mesa Grande (UCR)
^{a}*Papaver californicum* A. Gray Poser Mountain; Fire poppy
^{a}*Platystemon californicus* Benth. Cream-cups
^{s}*Romneya trichocalyx* Eastw. Matilija poppy

PLANTAGINACEAE/Plantain Family
^{h}*Plantago lanceolata** L. Rib-grass
^{h}*Plantago major** L. Common plantain
^{a}*Plantago patagonica* Jacq. Indian plantain

PLATANACEAE/Sycamore Family
^{t}*Platanus racemosa* Nutt. Western sycamore

POLEMONIACEAE/Phlox Family

[a]*Allophyllum gilioides* (Benth.) A.D. Grant & V. Grant subsp. *gilioides* Straggling false gilia

[a]*Allophyllum gilioides* (Benth.) A.D. Grant & V. Grant subsp. *violaceum* (A.A. Heller) Day

[a]*Allophyllum glutinosum* (Benth.) A.D. Grant & V. Grant

[a]*Collomia grandiflora* Lindley Grand phlox

[h]*Eriastrum densifolium* (Benth.) H. Mason subsp. *austromontanum* (Craig) H. Mason Chaparral woolly-star

[a]*Eriastrum filifolium* (Nutt.) Wooton & Standley

[a]*Eriastrum sapphirinum* (Eastw.) H. Mason Sapphire woolly-star

[a]*Gilia angelensis* V. Grant Grassland gilia

[a]*Gilia australis* (H. Mason & A.D. Grant) V. Grant & A.D. Grant

[a]*Gilia capitata* Sims subsp. *abrotanifolia* (E. Greene) V. Grant

[a]*Gilia caruifolia* Abrams Garnet Peak, Stonewall Peak

[a]*Gilia clivorum* (Jepson) V. Grant

[a]*Gilia diegensis* (Munz) A.D. Grant & V. Grant

[a]*Gilia ochroleuca* M.E. Jones subsp. *exilis* (A. Gray) A.D. Grant & V. Grant

[a]*Linanthus ciliatus* (Benth.) E. Greene Whisker-brush

[a]*Linanthus dianthiflorus* (Benth.) E. Greene Ground pink

[a]*Linanthus dichotomus* Benth. Cuyamaca Lake; Evening snow

[s]*Linanthus floribundus* (A. Gray) Milliken subsp. *floribundus*

[s]*Linanthus floribundus* (A. Gray) Milliken subsp. *glaber* R. Patterson Summer snow

[a]*Linanthus lemmonii* (A. Gray) E. Greene Julian

[a]*Linanthus liniflorus* (Benth.) E. Greene

[a]*Linanthus orcuttii* (C. Parry & A. Gray) Jepson

[a]*Linanthus parviflorus* (Benth.) E. Greene Baby stars

[a]*Linanthus pygmaeus* (Brand) J. Howell subsp. *continentalis* Raven

[a]*Navarretia atractyloides* (Benth.) Hook. & Arn. Skunkweed

[a]*Navarretia intertexta* (Benth.) Hook.

[a]*Navarretia peninsularis* E. Greene Gravelly clay soils; Cuyamaca Lake, Cuyamaca Peak

[a]*Navarretia tagetina* E. Greene Meadows; Cuyamaca Lake

[c]*Phlox austromontana* Cov. Prickly phlox

[a]*Phlox gracilis* E. Greene Slender phlox

POLYGALACEAE/Milkwort Family

[s]*Polygala cornuta* Kellogg var. *fishiae* (C. Parry) Jepson Viejas Mountain

POLYGONACEAE/Buckwheat Family

[a]*Chorizanthe fimbriata* Nutt. var. *laciniata* (Torrey) Jepson

[a]*Chorizanthe leptotheca* Goodman Corte Madera Ranch

[a]*Chorizanthe polygonoides* Torrey & A. Gray var. *longispina* (Goodman) Munz Knotweed spineflower

[a]*Chorizanthe procumbens* Nutt. Poser Mountain

[a]*Chorizanthe staticoides* Benth. Turkish rugging

[a]*Eriogonum apiculatum* S. Watson

[a]*Eriogonum davidsonii* E. Greene

[c]*Eriogonum elongatum* Benth. var. *elongatum*

[s]*Eriogonum fasciculatum* Benth. var. *fasciculatum* Corte Madera Ranch; Flat top buckwheat

[s]*Eriogonum fasciculatum* Benth. var. *foliolosum* (Nutt.) Abrams
[s]*Eriogonum fasciculatum* Benth. var. *polifolium* (A.DC.) Torrey & A. Gray
[a]*Eriogonum foliosum* S. Watson Leafy buckwheat
[a]*Eriogonum gracile* Benth. var. *gracile* Slender buckwheat
[a]*Eriogonum molestum* E. Greene
[h]*Eriogonum nudum* Benth. var. *pauciflorum* S. Watson
[a]*Eriogonum parishii* S. Watson
[s]*Eriogonum plumatella* Durand & Hilgard
[a]*Eriogonum thurberi* Torrey
[c]*Eriogonum umbellatum* Torrey var. *munzii* Rev. Mount Laguna
[c]*Eriogonum wrightii* Benth. var. *membranaceum* Jepson
[a]*Oxytheca trilobata* A. Gray Three-lobed spineflower
[h]*Polygonum amphibium* L. var. var. *emersum* Michaux Smartweed
[h]*Polygonum amphibium* L. var. *stipulaceum* Coleman
[a]*Polygonum arenastrum*• Boreau
[a]*Polygonum douglasii* E. Greene subsp. *douglasii*
[a]*Polygonum douglasii* E. Greene subsp. *johnstonii* (Munz) J. Hickman
[a]*Polygonum lapathifolium* L. Willow smartweed
[a]*Polygonum parryi* E. Greene Gravelly clay soils; Cuyamaca Lake, Cuyamaca Peak; Parry knotweed
[a]*Polygonum ramosissimum*• Michaux Bushy knotweed
[a]*Pterostegia drymarioides* Fischer & C. Meyer Hair-net
[h]*Rumex acetosella*• L. Red sorrel
[h]*Rumex conglomeratus*• Murray Green dock
[h]*Rumex crispus*• L. Curly dock
[h]*Rumex salicifolius* J.A. Weinm. var. *denticulatus* Torrey
[h]*Rumex salicifolius* J.A. Weinm. var. *salicifolius* Willow dock

PORTULACACEAE/Purslane Family
[a]*Calandrinia ciliata* (Ruiz Lopez & Pavon) DC. Red maids
[a]*Calyptridium monandrum* Nutt. Sandcress
[a]*Claytonia exigua* Torrey & A. Gray subsp. *exigua*
[a]*Claytonia parviflora* Hook. subsp. *parviflora*
[a]*Claytonia parviflora* Hook. subsp. *viridis* (Davidson) J.M. Miller & Chambers
[a]*Claytonia perfoliata* Willd. subsp. *mexicana* (Rydb.) J.M. Miller & Chambers
[a]*Claytonia perfoliata* Willd. subsp. *perfoliata* Miner's lettuce
[g]*Lewisia brachycalyx* A. Gray Southwestern bitter-root
[g]*Lewisia nevadensis* (A. Gray) Robinson
[h]*Montia chamissoi* (Sprengel) E. Greene Cuyamaca, Laguna meadows
[a]*Montia fontana* L. Water montia
[a]*Montia linearis* (Hook.) E. Greene
[a]*Portulaca oleracea*• L. Common purslane

PRIMULACEAE/Primrose Family
[a]*Anagallis arvensis*• L. Scarlet pimpernel
[a]*Androsace elongata* L. subsp. *acuta* (E. Greene) G. Robb.
[a]*Centunculus minimus* L. Chaffweed
[h]*Samolus parviflorus* Raf. Water pimpernel

RANUNCULACEAE/Crowfoot Family
[g]*Anemone tuberosa* Rydb. Poser Mountain, Scove Canyon

[h]*Aquilegia formosa* Fischer Columbine
[l]*Clematis lasiantha* Nutt. Virgin's bower
[l]*Clematis ligusticifolia* Nutt. Yerba de chivato
[l]*Clematis pauciflora* Nutt. Ropevine
[h]*Delphinium cardinale* Hook. Scarlet larkspur
[h]*Delphinium hesperium* A. Gray subsp. *cuyamacae* (Abrams) Harlan Lewis & Epling Cuyamaca larkspur
[h]*Delphinium parishii* A. Gray subsp. *subglobosum* (Wiggins) Harlan Lewis & Epling Garnet Mountain, Pinyon Flat
[h]*Delphinium parryi* A. Gray subsp. *parryi*
[h]*Delphinium patens* Benth. subsp. *hepaticoideum* Ewan
[a]*Myosurus minimus* L. Mouse-tail
[h]*Ranunculus aquatilus* L. var. *capillaceus* (Thuill.) DC.
[h]*Ranunculus aquatilus* L. var. *hispidulus* E. Drew
[h]*Ranunculus californicus* Benth. California buttercup
[h]*Ranunculus cymbalaria* Pursh var. *saximontanus* Fern.
[a]*Ranunculus testiculatis** Crantz. Cuyamaca RSP (RSA-POM)
[h]*Thalictrum fendleri* A. Gray var. *fendleri* Meadow-rue
[h]*Thalictrum fendleri* A. Gray var. *polycarpum* Torrey

RHAMNACEAE/Buckthorn Family
[s]*Ceanothus cuneatus* (Hook.) Nutt. var. *cuneatus*
[s]*Ceanothus foliosus* C. Parry var. *foliosus* Viejas, Cuyamaca
[s]*Ceanothus greggii* A. Gray var. *perplexans* (Trel.) Jepson
[s]*Ceanothus leucodermis* E. Greene Whitebark wild lilac
[s]*Ceanothus oliganthus* Nutt. var. *oliganthus*
[s]*Ceanothus palmeri* Trel.
[s]*Rhamnus crocea* Nutt. Spiny redberry
[s]*Rhamnus ilicifolia* Kellogg Holly-leaf redberry
[s]*Rhamnus tomentella* Benth. subsp. *tomentella*
[s]*Ziziphus parryi* Torrey var. *parryi* Lotebush

ROSACEAE/Rose Family
[s]*Adenostoma fasciculatum* Hook. & Arn. Chamise
[s]*Adenostoma sparsifolium* Torrey Red shanks
[h]*Agrimonia gryposepala* Wallr. Agrimony
[s]*Amelanchier utahensis* Koehne Service-berry
[s]*Cercocarpus betuloides* Torrey & A. Gray var. *betuloides*
[s]*Cercocarpus minutiflorus* Abrams Viejas Mountain
[h]*Fragaria vesca* L. Wild strawberry
[s]*Heteromeles arbutifolia* (Lindley) Roemer Toyon
[s]*Holodiscus discolor* (Pursh) Maxim. Cuyamaca Peak, Monument Peak
[h]*Horkelia clevelandii* (E. Greene) Rydb.
[h]*Horkelia truncata* Rydb. Viejas Mountain, Boulder Creek
[h]*Potentilla glandulosa* Lindley subsp. *glandulosa* Cinquefoil
[h]*Potentilla glandulosa* Lindley subsp. *reflexa* (E. Greene) Keck
[h]*Potentilla gracilis* Hook. var. *fastigiata* (Nutt.) S. Watson
[a]*Potentilla norvegica** L. Rough cinquefoil
[s]*Prunus emarginata* (Hook.) Walp. Bitter cherry
[s]*Prunus fremontii* S. Watson Banner; Desert apricot
[s]*Prunus ilicifolia* (Nutt.) Walp. subsp. *ilicifolia*

[s]*Prunus virginiana* L. var. *demissa* (Nutt.) Torrey
[s]*Rosa californica* Cham. & Schldl. California wild rose
[s]*Rosa woodsii* Lindley var. *ultramontana* (S. Watson) Jepson
[h]*Rubus glaucifolius* Kellogg var. *ganderi* (L. Bailey) Munz
[h]*Rubus laciniatus*[*] Willd. Cut-leaf blackberry
[h]*Rubus parviflorus* Nutt. Thimbleberry
[h]*Rubus ursinus* Cham. & Schldl. California blackberry
[h]*Sanguisorba minor* Scop. subsp. *muricata*[*] Briq.
[u]*Sanguisorba occidentalis* Nutt. Cuyamaca Lake, Cuyamaca Peak

RUBIACEAE/Madder Family
[c]*Galium andrewsii* A. Gray subsp. *andrewsii* Moss bedstraw
[s]*Galium angustifolium* Nutt. subsp. *angustifolium*
[a]*Galium aparine*[*] L. Common bedstraw
[l]*Galium porrigens* Dempster var. *porrigens* Oval-leaf bedstraw

SALICACEAE/Willow Family
[t]*Populus fremontii* S. Watson subsp. *fremontii* Fremont cottonwood
[s]*Salix exigua* Nutt. Narrow-leaf willow
[t]*Salix gooddingii* C. Ball Black willow
[t]*Salix laevigata* Bebb. Red willow
[t]*Salix lasiolepis* Benth. Arroyo willow

SAURURACEAE/Lizard-tail Family
[a]*Anemopsis californica* (Nutt.) Hook. & Arn. Yerba mansa

SAXIFRAGACEAE/Saxifrage Family
[h]*Boykinia rotundifolia* C. Parry
[h]*Heuchera brevistaminea* Wiggins Mt. Laguna alum-root
[h]*Heuchera rubescens* Torrey var. *versicolor* (E. Greene) M.G. Stewart Cuyamaca Peak, Harper's Creek, Scove Canyon
[h]*Jepsonia parryi* (Torrey) Small Poser Mountain, Cedar Creek
[h]*Lithophragma affine* A. Gray Woodland star
[g]*Lithophragma glabrum* Nutt. Seeps, meadows; Corte Madera Ranch, Cuyamaca Lake, Laguna Mountains
[h]*Saxifraga californica* E. Greene California saxifrage

SCROPHULARIACEAE/Snapdragon Family
[a]*Antirrhinum coulterianum* Benth. Coulter's snapdragon
[a]*Antirrhinum kelloggii* E. Greene Poser Mountain
[a]*Antirrhinum nuttallianum* Benth. subsp. *nuttallianum*
[p]*Castilleja affinis* Hook. & Arn. subsp. *affinis* Paint-brush
[p]*Castilleja applegatei* Fern. subsp. *martinii* (Abrams) Chuang & Heckard
[p]*Castilleja attenuata* (A. Gray) Chuang & Heckard
[p]*Castilleja densiflora* (Benth.) Chuang & Heckard subsp. *gracilis* (Benth.) Chuang & Heckard
[p]*Castilleja exserta* (A.A. Heller) Chuang & Heckard subsp. *exserta* [*Orthocarpus purpurascens* Benth.]
[p]*Castilleja foliolosa* Hook. & Arn. Woolly paint-brush
[p]*Castilleja miniata* Hook. subsp. *miniata* Giant red paint-brush

^{a}*Castilleja minor* (A. Gray) A. Gray subsp. *spiralis* (Jepson) Chuang & Heckard California thread-torch
^{p}*Castilleja subinclusa* E. Greene subsp. *subinclusa*
^{a}*Collinsia childii* A. Gray Child's blue-eyed mary
^{a}*Collinsia concolor* E. Greene Southern chinese houses
^{a}*Collinsia heterophylla* Buist Chinese houses
^{a}*Collinsia parviflora* Lindley Smallflower blue-eyed mary
^{a}*Cordylanthus nevinii* A. Gray Cuyamaca Peak, Wooded Hill
^{a}*Cordylanthus rigidus* (Benth.) Jepson subsp. *setigerus* Chuang & Heckard Thread-leaf bird's beak
^{s}*Keckiella antirrhinoides* (Benth.) Straw var. *antirrhinoides*
^{s}*Keckiella cordifolia* (Benth.) Straw Heart-leaf bush penstemon
^{s}*Keckiella ternata* (Torrey) Straw var. *ternata*
^{a}*Limosella acaulis* Sesse & Mocino Mudwort
^{u}*Linaria canadensis* (L.) Dum.-Cours. Blue toad-flax
^{u}*Linaria genistifolia* (L.) Miller subsp. *dalmatica** (L.) Maire & Petitm. Dalmation toad-flax
^{a}*Mimulus androsaceus* E. Greene 3 miles east of Banner
^{s}*Mimulus aurantiacus* Curtis [*M. aridus* (Abrams) A.L. Grant; *M. longiflorus* (Nutt.) A.L. Grant; *M. puniceus* (Nutt.) Steudel]
^{a}*Mimulus brevipes* Benth. Slope semaphore
^{a}*Mimulus breweri* (E. Greene) Cov. Cuyamaca RSP
^{h}*Mimulus cardinalis* Benth. Scarlet monkey flower
^{h}*Mimulus clevelandii* Brandegee
^{a}*Mimulus congdonii* Robinson Damp, sandy areas in chaparral; Descanso, Poser Mountain
^{a}*Mimulus floribundus* Lindley
^{a}*Mimulus fremontii* (Benth.) A. Gray
^{a}*Mimulus guttatus* DC. Seep monkey flower
^{a}*Mimulus palmeri* A. Gray
^{a}*Mimulus pilosus* (Benth.) S. Watson
^{a}*Mimulus rubellus* A. Gray Indian Canyon, Poser Mountain (RSA-POM)
^{h}*Pedicularis semibarbata* A. Gray
^{c}*Penstemon centranthifolius* (Benth.) Benth. Scarlet buglar
^{h}*Penstemon clevelandii* A. Gray var. *clevelandii*
^{c}*Penstemon heterophyllus* Lindley var. *australis* Munz & I.M. Johnston
^{c}*Penstemon heterophyllus* Lindley var. *heterophyllus*
^{h}*Penstemon labrosus* (A. Gray) Hook. *f.*
^{h}*Penstemon rostriflorus* Kellogg [*P. bridgesii* A. Gray misappl.]
^{h}*Penstemon spectabilis* Thurber var. *spectabilis* Showy penstemon
^{h}*Scrophularia californica* Cham. & Schldl. subsp. *floribunda* (E. Greene) Shaw California bee plant
^{a}*Triphysaria eriantha* (Benth.) Chuang & Heckard subsp. *eriantha*
^{h}*Verbascum thapsus** L. Woolly mullein
^{a}*Veronica anagallis-aquatica** L.
^{a}*Veronica arvensis** L. Corn speedwell
^{a}*Veronica peregrina* L. subsp. *xalapensis* (Kunth) Pennell

SIMAROUBACEAE/Quassia Family
^{t}*Ailanthus altissima** (Miller) Swingle Tree of heaven

SOLANACEAE/Nightshade Family
[u]*Datura wrightii* Regel Thorn-apple
[a]*Nicotiana attenuata* Torrey Coyote tobacco
[s]*Nicotiana glauca** Graham Tree tobacco
[a]*Nicotiana obtusifolia* Martens & Galeotti Desert tobacco
[a]*Nicotiana quadrivalvis* Pursh
[u]*Petunia parviflora* A.L. Juss. Wild petunia
[c]*Physalis crassifolia* Benth. Thick-leaf groundcherry
[a]*Physalis pubescens* L. var. *integrifolia** (Dunal) Waterf.
[u]*Solanum americanum** Miller White nightshade
[s]*Solanum parishii* A.A. Heller
[s]*Solanum umbelliferum* Eschsch. Blue witch
[s]*Solanum xanti* A. Gray

STERCULIACEAE/Cacao Family
[s]*Femontodendron californicum* (Torrey) Cov. subsp. *californicum*

STYRACACEAE/Storax Family
[s]*Styrax officinalis* L. var. *redivivus* (Torrey) H. Howard

TAMARICACEAE/Tamarisk Family
[s]*Tamarix ramosissima** Ledeb. Corte Madera Ranch; Tamarisk

ULMACEAE/Elm Family
[s]*Celtis reticulata* Torrey Net-leaf hackberry

URTICACEAE/Nettle Family
[a]*Hesperocnide tenella* Torrey Corte Madera Ranch; Rock nettle
[a]*Parietaria hespera* B.D. Hinton var. *californica* B.D. Hinton Poser Mountain
[h]*Urtica dioica* L. subsp. *holosericea* (Nutt.) Thorne
[a]*Urtica urens** L. Corte Madera Ranch; Dwarf nettle

VALERIANACEAE/Valerian Family
[a]*Plectritis brachystemon* Fischer & C. Meyer
[a]*Plectritis ciliosa* (E. Greene) Jepson subsp. *insignis* (Suksd.) D. Morey Southern plectritis

VERBENACEAE/Vervain Family
[c]*Phyla nodiflora* (L.) E. Greene var. *nodiflora** Corte Madera
[h]*Verbena lasiostachys* Link. var. *lasiostachys* Western vervain

VIOLACEAE/Violet Family
[h]*Viola douglasii* Steudel Douglas violet
[h]*Viola lobata* Benth. subsp. *integrifolia* (S. Watson) R.J. Little
[h]*Viola lobata* Benth. subsp. *lobata*
[h]*Viola pedunculata* Torrey & A. Gray Johnny-jump-up
[h]*Viola purpurea* Kellogg subsp. *purpurea* Mountain violet
[h]*Viola purpurea* Kellogg subsp. *quercetorum* (M. Baker & J. Clausen) R.J. Little
[h]*Viola sororia* Willd. subsp. *affinis* (LeConte) R.J. Little

VISCACEAE/Mistletoe Family
^{p}*Arceuthobium californicum* Hawksw. & Wiens
^{p}*Arceuthobium campylopodum* Engelm. Western dwarf mistletoe
^{p}*Phoradendron densum* Trel. Dense mistletoe
^{p}*Phoradendron macrophyllum* (Engelm.) Cockerell
^{p}*Phoradendron pauciflorum* Torrey White-fir mistletoe
^{p}*Phoradendron villosum* (Nutt.) Nutt. Oak mistletoe

VITACEAE/Grape Family
^{l}*Vitis girdiana* Munson Desert grape

ZYGOPHYLLACEAE/Caltrop Family
^{h}*Tribulus terrestris** L. Puncture vine

SYMBOLS USED IN THIS CHECKLIST

^{t} Tree, 6 to 25 meters tall
^{s} Shrub, 0.5 to 6 meters tall
^{c} Chamaephyte, vegetative buds not over 0.5 meters above the ground
^{h} Hemicryptophyte, vegetative buds at surface of soil
^{g} Geophyte, vegetative buds below the surface of soil
^{a} Annual
^{l} Liana, vine
^{p} Parasite
^{u} Plants with life forms ranging from annual to perennial or shrub. These are included in the life form spectrum as "unclassified".
~ Cryptogam (no code)
* Denotes non-native taxon
Cuyamaca RSP = Cuyamaca Rancho State Park

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APPENDIX I. DISJUNCTS OF THE LAGUNA AND CUYAMACA MOUNTAINS

This list is divided into three parts based on plant distribution, climate. and geology. For an explanation of plant habitat, rarity, and endangerment codes, please refer to the *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California* (Skinner & Pavlik 1994). Geographic codes follow Hickman (1993).

A. Plants occurring in both the Laguna and Cuyamaca mountains and/or adjacent areas including Corte Madera and Volcan mountains at elevations of 1212 to 1970 meters (4,000 to 6,500 feet).

Delphinium hesperium subsp. *cuyamacae* List 1B:2-2-3, CR/C2 LCFrs, Medws (mesic), typical subsp. from SnFrB

Helianthella californica var. *nevadensis* LCFrs, VFGrs, near summit of Volcan Mountain, disjunct from SN

Lasthenia glaberrima Medws, Corte Madera and Cuyamaca lakes, disjunct from San Luis Obispo County

Limnanthes gracilis subsp. *parishii* List 1B:2-2-3, CE/C2 Medws (vernally mesic), VnPls, typical subsp. from OR

Minuartia pusilla Chprl, LCFrs/sand or clay, disjunct from SnFrB

Thermopsis californica var. *semota* List 1B:2-2-3 CmWld, LCFrs, VFGrs, typical subsp. from nSW

B. Plants occurring in the Cuyamaca Mountains at elevations of 1212 to 1970 meters (4,000 to 6,500 feet).

Aspidotis densa LCFrs, Medws/gabbro outcrops on Cuyamaca Peak, disjunct from SN, usually on serpentine

Ceanothus foliosus var. *foliosus* Chprl/gabbro, disjunct from SnFrB

Danthonia unispicata Medws/gabbro, disjunct from SN

Downingia concolor var. *brevior* List 1B:3-3-3, CE/C1 Medws (mesic), VnPls, typical subsp. from SnFrB

Epilobium minutum Chprl, Medws/gabbro, Cuyamaca Peak, disjunct from CW, SN

Gayophytum humile Medws/gabbro, Cuyamaca Lake and Cuyamaca Peak, disjunct from SnBr

Lewisia brachycalyx List 4:1-1-1 Medws (mesic)/gabbro, disjunct from SnBr

Lewisia nevadensis Medws (mesic)/gabbro, disjunct from SnBr

Navarretia tagetina Medws, Cuyamaca Lake, disjunct from ScV
Moehringia macrophylla LCFrs/gabbro, disjunct from SCoRO, usually on serpentine
Polygonum parryi Medws (mesic)/gabbro, Cuyamaca Lake, Cuyamaca Peak, disjunct from SN
Rubus glaucifolius var. *ganderi* List 1B:3-1-3 LCFrs/gabbro, typical subsp. from SN
Sanguisorba occidentalis Medws/gabbro, disjunct from nCCO, SNH

C. Plants occurring in the foothills of the Cuyamaca Mountains at elevations of 910 to 1212 meters (3,000 to 4,000 feet).

Ceanothus foliosus var. *foliosus* Chprl/gabbro, disjunct from SnFrB
Filago arizonica Chprl, VFGrs/damp clay, coastal-desert disjunct, from se AZ, nw México
Harpagonella palmeri List 2:1-2-1 Chprl, CoScr, VFGrs/damp clay, coastal-desert disjunct, from AZ, nw México
Mimulus congdonii Chprl/damp sand, disjunct from SN and Ventura County

APPENDIX II. LIFE FORM SPECTRUM

	Total	%	Native	%
Trees	30	3.0	28	2.8
Shrubs	123	12.4	121	12.1
Chamaephytes	27	2.7	26	2.6
Hemicryptophytes	327	32.8	283	28.4
Annuals	383	38.5	294	29.6
Geophytes	27	2.7	27	2.7
Parasites	18	1.8	18	1.8
Lianas	5	0.5	5	0.5
Unclassified	29	2.9	18	1.8
Cryptogams	27	2.7	27	2.7
Total	996		847	85.0

APPENDIX III. NUMBER OF INTRODUCED GENERA AND SPECIES BY FAMILY

Family	Genera	Species
Aizoaceae	1	1
Amaranthaceae	1	2
Apiaceae	7	7
Asteraceae	13	18
Brassicaceae	11	13
Caryophyllaceae	5	7
Chenopodiaceae	3	3
Dipsacaceae	1	1
Euphorbiaceae	1	1
Fabaceae	6	9
Geraniaceae	2	3
Hypericaceae	1	1
Lamiaceae	3	4
Lythraceae	1	1
Malvaceae	1	1
Meliaceae	1	1
Nelumbonaceae	1	1
Onagraceae	1	1
Plantaginaceae	1	2
Polygonaceae	2	4
Portulacaceae	1	1
Primulaceae	1	1
Ranunculaceae	1	1
Rosaceae	3	3
Rubiaceae	1	1
Scrophulariaceae	2	4
Simaroubaceae	1	1
Solanaceae	2	2
Tamaricaceae	1	1
Urticaceae	1	1
Verbenaceae	1	1
Zygophyllaceae	1	1
Liliaceae	1	1
Poaceae	28	49
Total	108	149 (15%)

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PERYMENIUM BASASEACHICANUM (ASTERACEAE, HELIANTHEAE), A NEW SPECIES FROM CHIHUAHUA, MEXICO

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ABSTRACT

A new species, ***Perymenium basaseachicanum*** B.L. Turner, *spec. nov.*, is described. It is known by numerous recent collections and is seemingly confined to southwestern Chihuahua. It belongs to the herbaceous elements of *Perymenium* and is closely related to *P. oxycarphum*. A key to the four herbaceous species of *Perymenium* is provided, along with a map showing the distribution of *P. basaseachicanum*, and a photograph of the holotype.

KEY WORDS: Asteraceae, Perymenium, México, Chihuahua, systematics

Perymenium is a relatively large genus, containing approximately 40 species, most of these shrubby elements largely confined to México (Fay 1978). A few species of *Perymenium* are low perennial herbs, the stems slender and dying back after each growing season, arising anew from swollen tuber-like roots. With the addition of *P. basaseachicanum*, described below, the genus is now known to have four such herbaceous species, one of these *P. buphthalmoides* DC. having five morphogeographical varieties (Turner 1988). The following key will distinguish these four species, and Figure 2 shows the distribution of *P. basaseachicanum*, which does not overlap that of the other taxa, nor do the several species appear to intergrade.

KEY TO HERBACEOUS SPECIES OF *PERYMENIUM*

1. Involucral bracts 2-seriate, subequal, mostly (6-)7-12 mm long. *P. buphthalmoides*
1. Involucral bracts 3-4 seriate, imbricate to subimbricate, mostly 4-6 mm long.....(2)
    2. Leaves elliptic, coriaceous, widest near the middle; Jalisco. .... *P. jaliscense*
    2. Leaves ovate, herbaceous, widest near the base; Pacific slopes (Oaxaca to Sonora) and western Chihuahua...(3)

3. Leaves with blades ovate to ovate-elliptic, 1-2 times as long as wide, the petioles 4-20 mm long, widespread..*P. oxycarphum*

3. Leaves with blades ovate-lanceolate, 2-3 times as long as wide, the petioles 0.5-2.0 mm long; Chihuahua. .... *P. basaseachicanum*

PERYMENIUM BASASEACHICANUM B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Chihuahua: Cascada Basaseachic, South Overview to Rancho San Lorenzo Hotel, pine-oak woodlands in "sterile tuff" and rich meadows, 2150 m, 22 Jul 1986, *P.S. Martin, et al. s.n.* (HOLOTYPE: TEX!; Isotype: ARIZ).

Simile *P. oxycarpho* S.F. Blake sed foliis medicalium ovatis-lanceolatis (vice foliorum ovatorum aut ovatorum-ellipticorum), 2-3plo longioribus quam latioribus (vice 1-2plo), et petiolis 0.5-2.0 mm longis (vice 4-20 mm longis).

Perennial herbs 30-50 cm high. Stems erect, arising from underground, tuber-like roots, sparsely to moderately strigose. Midstem leaves mostly 3-5 cm long, 1.0-2.5 cm wide; petioles 0.5-2.0 mm long; blades ovate lanceolate, 3-nervate from the base, 2-3 times as long as wide, sparsely to moderately hispidulous below with rough hairs, the margins remotely dentate. Heads 1-3(-5) in terminal open cymes, the ultimate peduncles slender, 3-10 cm long. Involucres 3-4 seriate, 4-6 mm high, 6-10 mm wide (pressed); bracts broadly ovate, coarsely short-hispid, scarcely herbaceous, except for the short obtuse apices. Receptacles convex, 2-3 mm across. Receptacular bracts folded-lanceolate, persistent, their apices acute, hispidulous. Ray florets, 8-11, pistillate, fertile; ligules yellow, 8-10 mm long, ca. 2 mm wide. Disk florets 30-40 (estimated), yellow, 4-5 mm long, the narrow throat ca. as long as the limb, the lobes 5, ca. 0.7 mm long. Achenes ca. 3 mm long; pappus of ca. 20 deciduous bristles 1-3 mm long.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Chihuahua: Mpio. Guachochic, NW of Norogachic at airport, ca. 1950 m, 23 Aug 1978, *Bye 8819* (NMSU,TEX); Mpio. Bocoyna, mesa W of Creel between Creel and Río Oteros, ca. 2360 m, 16 Oct 1977, *Bye & Weber 8204* (LL); Mpio. Guadalupe y Calvo, NW side of Cerro Mohinora, ca. 12.5 mi SW of Guadalupe y Calvo, 2470 m, *Nesom 6487* (TEX); Cascada Basaseachic, 1 Oct 1986, *Martin, et al. 42* (NMSU); 37.6 km SW of El Vergel on road to Guadalupe y Calvo, ca. 2500 m, 27 Aug 1983, *Nesom 4949* (TEX); Norogachi, ca. 5000 ft., 18 Jul 1955, *Pennington 678* (TEX); Cascada Basaseachic, ca. 1 km airline S of Cascada in "thin soil over rock at overlook," ca. 2100 m, 3 Oct 1986, *Spellenberg, et al. 9270* (TEX).

This species is superficially similar to *Perymenium buphthalmoides* var. *tenellum* (A. Gray) McVaugh, but is readily distinguished from the latter by its small 3-4 seriate, subimbricate to imbricate involucres. Fay (1978) examined only one sheet of the taxon (*Pennington 678* [TEX]) annotating this as "probably" *P. b.* var. *tenellum.* I was content with this name until numerous additional collections showed that the involucral characters are more like those of *P. oxycarphum* S.F. Blake, a widespread herbaceous taxon of the Pacific coast slopes (Turner 1987), distributed from Oaxaca to Sonora, and readily distinguished from *P. basaseachicanum* by its broadly ovate blades borne upon well-defined petioles, as noted in the above key.

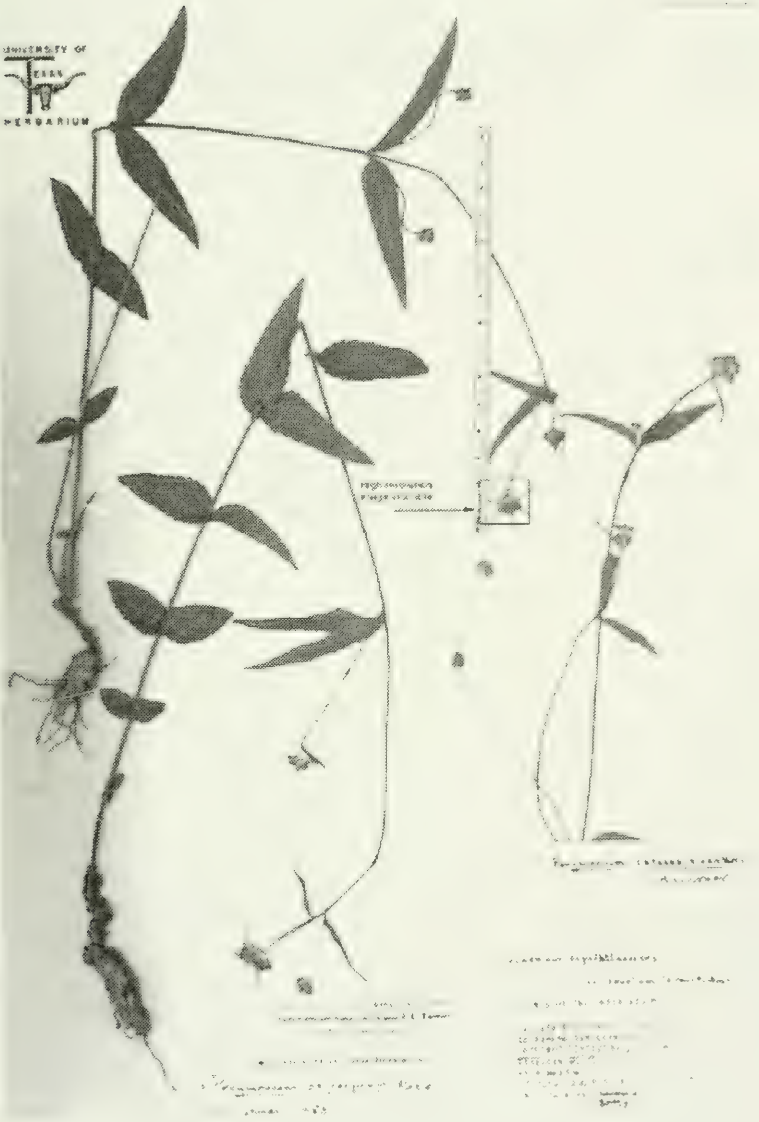

Figure 1. Scanning photograph of *Perymenium basaseachicanum* (holotype).

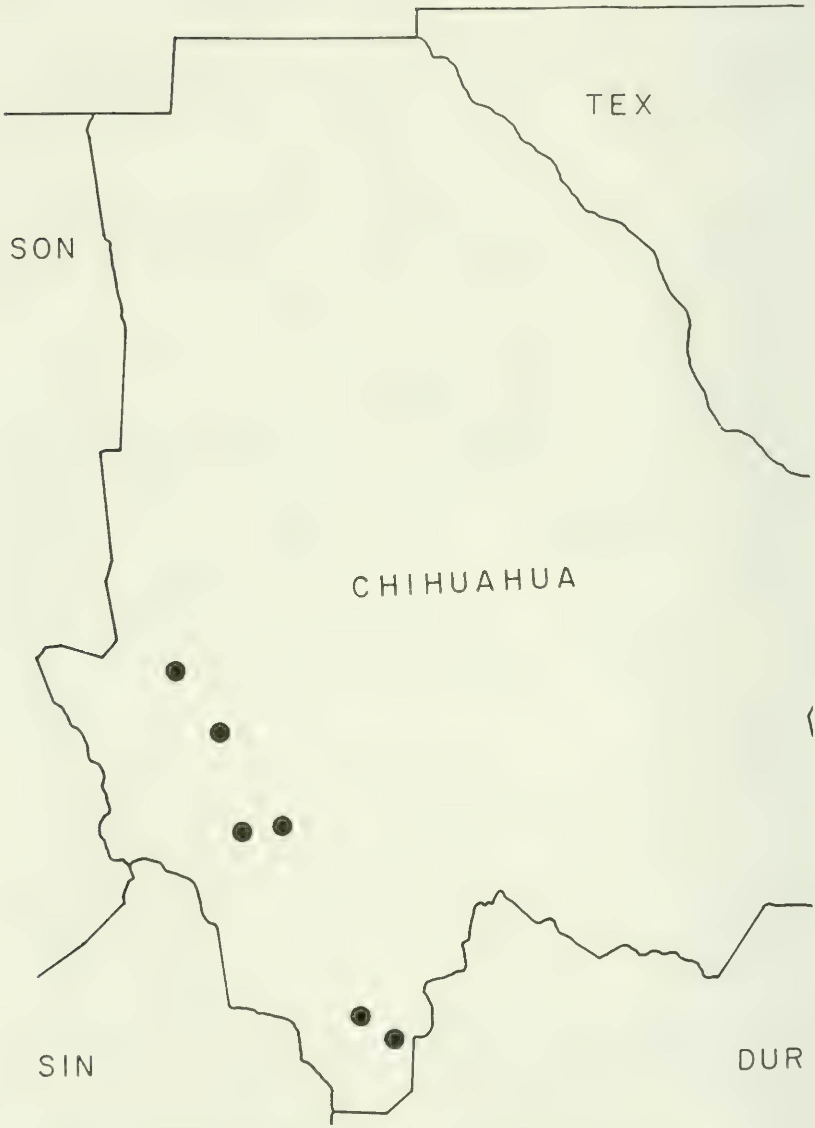

Figure 2. Distribution of *Perymenium basaseachicanum* (based upon collections at LL, TEX).

It should also be noted here that label data on the Pennington collection (cited above) states that the Tarahumar name for the taxon is NAWABORI (a generic name used for plants having edible roots) and that the Indians ate these, either "cooked, or raw."

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Justin Williams for reviewing the manuscript.

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Phytologia (August 1996) 81(2):108-114

TAXONOMIC NOTES ON TEXAN AND MEXICAN SPECIES OF *HEDYOTIS* AND *HOUSTONIA* (RUBIACEAE)

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ABSTRACT

Recent taxonomic papers by B.L. Turner concerning Texan and Mexican *Hedyotis* and *Houstonia* are reviewed. Diagnostic characters for *Hedyotis* and *Houstonia* are discussed briefly. Two subspecies of *Houstonia acerosa* are recognized: subsp. *acerosa* and subsp. *polypremoides*. A key and distribution map of *H. acerosa* are provided. *Houstonia palmeri* is retained without varieties pending further study. One of three new varieties of *Hedyotis nigricans* established by Turner (var. *gypsophila*) is accepted here as taxonomically valid. A new species, *Hedyotis pooleana*, created by Turner, is synonymized under *H. mullerae*.

KEY WORDS: Rubiaceae, *Hedyotis*, *Houstonia*, systematics, México, Texas

The following commentary discusses taxonomic data on *Hedyotis* and *Houstonia* published by B.L. Turner (1995a-d). His four papers in the July and August 1995 issues of Phytologia, owing to a lag in publication for this journal, were published in spring 1996, only about two months prior to the publication on June 10 of my monograph on *Houstonia* (Terrell 1996). I am now taking the opportunity to comment on Turner's papers.

First, I wish to comment on Turner's circumscription of *Hedyotis* and his placement of *H. acerosa* and *H. palmeri* in *Hedyotis* rather than *Houstonia*. In my monograph (Terrell 1996) I circumscribed *Houstonia* to include 20 North American species. *Hedyotis* includes a broad heterogeneous array of species mostly native to Asia, with North and South American species presently in *Hedyotis* considered more distantly related to and probably not congeneric with the Asian species. My monograph provided illustrations of representative seed types demonstrating that *Houstonia* seeds are always crateriform, *i.e.*, have a ventral cavity, concavity or depression. In the subgenus *Houstonia*, the seeds have a rounded ridgeless cavity; in the subgenus *Chamisme*, the concavities or depressions have a hilar ridge. In contrast, the vast majority of *Hedyotis* species are non-crateriform, thus lack a ventral cavity, concavity, or depression. Those very few species which have crateriform seeds have other features setting them distinctly apart from both genera, and their proper classification is being studied. The seeds of *Oldenlandia* are also non-crateriform, but are quite different in being conic or trigonous and much smaller and more numerous. These three genera also differ from each other in basic chromosome numbers (see Terrell 1996) and are thus genetically isolated.

Houstonia acerosa (A. Gray) Bentham & Hooker *f.* (*Hedyotis acerosa* A. Gray)

It is sometimes difficult in classifying a species to know whether to emphasize the morphological extremes as subspecies or varieties, or whether to emphasize the existence of much morphological overlap as indicative of there being just one variable species without infraspecific entities. In the case of the variable *Houstonia acerosa* (alias *Hedyotis acerosa*) previous authors have tended to recognize the existence of two varieties or subspecies. In 1996, impressed by the extensive intergradation, I circumscribed *Houstonia acerosa* as just one variable species without infraspecific entities. The opposite extreme was followed by Turner (1995b), who recognized four varieties: *Hedyotis acerosa* var. *acerosa*, var. *polypremoides* (A. Gray) W.H. Lewis, var. *potosina* B.L. Turner, and var. *tamaulipana* B.L. Turner.

After re-considering the variation in *Houstonia acerosa*, I now believe that despite considerable intergradation, the two morphological extremes (see key below) and their partial but definite geographic separation (Figure 1) are sufficient to support their recognition as subsp. *acerosa* (Texas to San Luis Potosí) and subsp. *polypremoides* (New Mexico and western Texas to Chihuahua and Coahuila), as previously published in 1979, rather than as varieties. The differences between these two entities are on a level higher than the usual variety. In addition, the geographical separation in New Mexico and adjacent lands is clearly marked, despite intergradation in western Texas and northern México.

Turner (1995b) stated that var. *acerosa* and var. *polypremoides* differ (among other characters) in the presence or absence of down-curved stem hairs; however, I could not find these hairs and interpret the vestiture as usually densely puberulent with very short hairs. (It may be noted that in his key to Mexican species Turner [1995b] erroneously listed a "var. *fasciculata*", which should have been listed as var. *acerosa*). The following synonymy is summarized from Terrell (1996); the types are cited in the monograph.

Houstonia polypremoides A. Gray, Proc. Amer. Acad. Arts 21:379. 1886. *Hedyotis polypremoides* (A. Gray) Shinners, Field & Lab. 17:168. 1949. *Hedyotis acerosa* A. Gray var. *polypremoides* (A. Gray) W.H. Lewis, Ann. Missouri Bot. Gard. 55:31. 1968, *nom. superfl.* *Houstonia acerosa* (A. Gray) Bentham & Hooker *f.* subsp. *polypremoides* (A. Gray) Terrell, Brittonia 31:168. 1979.

Houstonia polypremoides A. Gray var. *bigelovii* Greenman, Proc. Amer. Acad. Arts 32:291. 1897. *Hedyotis acerosa* A. Gray var. *bigelovii* (Greenman) W.H. Lewis, Ann. Missouri Bot. Gard. 55:397. 1969.

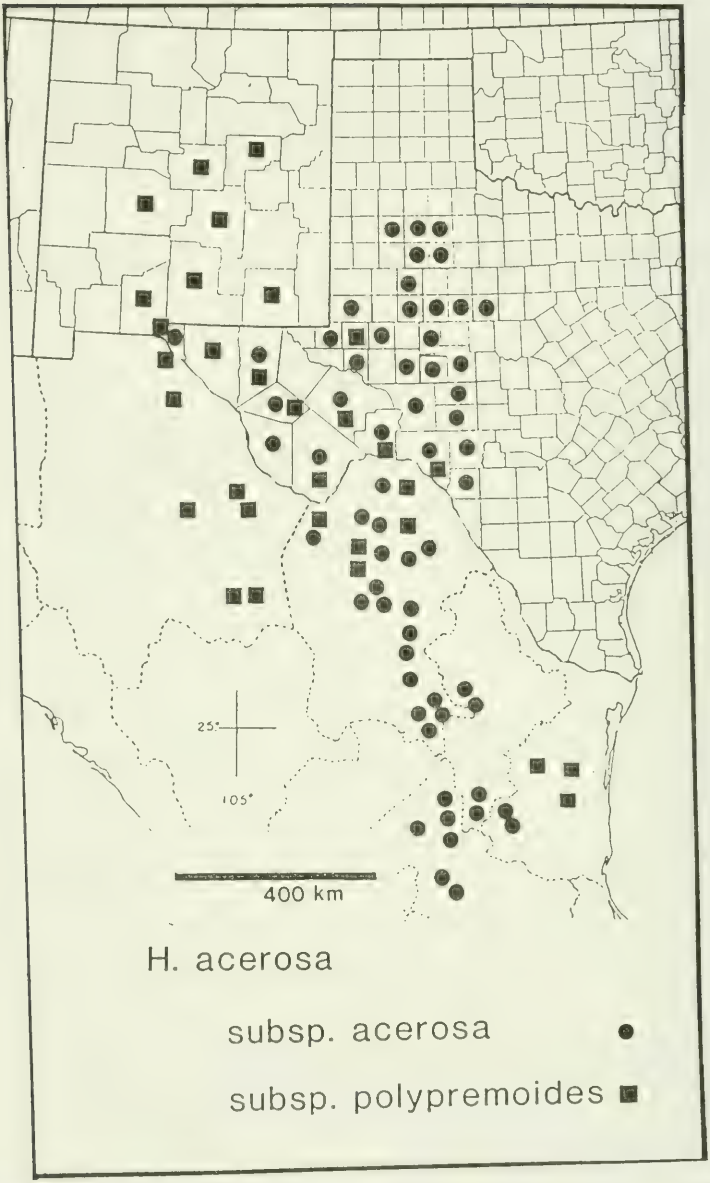

Figure 1. Distribution of *Houstonia acerosa* subsp. *acerosa* (circles) and subsp. *polypremoides* (squares).

Key to subspecies of *Houstonia acerosa*

1. Stems densely leafy; internodes usually 3-10 mm long; leaves mostly verticillate, fasciculate, numerous, often crowded and overlapping, acerose; flowers and capsules sessile or on pedicels to 3 mm long, sometimes densely grouped. ....subsp. *acerosa*
1. Stems not densely leafy; internodes usually 10-25 mm long; leaves opposite or some verticillate, not or some leaves fasciculate, not crowded or overlapping, linear or acerose; flowers and capsules on pedicels 3-22 mm long, the inflorescence often open and diffuse. ....subsp. *polypremoides*

The remaining two varieties of *Houstonia acerosa* are discussed as follows.

Var. *potosina* B.L. Turner has low, pulvinate, mat-like plants with much-shortened internodes and long corolla tubes (8-10 mm long), and occurs from southernmost Coahuila to San Luis Potosí. In 1996 I considered these low plants as part of a cline that northward has taller plants with coarser leaves and longer internodes. In southern Texas there are collections that are somewhat transitional, with rather fine leaves and small stature (e.g., *Lewis 5517*, Pecos Co.; *Orcutt 734*, Terrell Co.; and *Palmer 11057*, Valverde Co.; these at US). In corolla tube length there appears so much overlap that this character is not diagnostic. For these reasons I cannot recognize this new variety, and synonymize it under subsp. *acerosa*. The type specimen of *Hedyotis acerosa*, *Wright 237* (see Terrell 1996), was collected in "Western Texas to El Paso, New Mexico" in 1849, and consists of plants like those cited above.

Var. *tamaulipana* B.L. Turner differs from var. *polypremoides* in having corolla tubes mostly 3-4 mm long and calyx lobes 1.5-2.0 mm long, compared to 4-7(-12) mm long and 2-5(-7) mm long. Turner (1995b) cited a type and two other collections from Tamaulipas. I was previously aware of these different-looking collections, had examined them in detail after borrowing them on loan twice from TEX, and cited and mentioned them (Terrell 1996:91), while including them in *H. acerosa* sens. lat. My study of them confirmed Turner's measurement for the corolla tube lengths, however, for calyx lobe lengths I found 1.0 to 2.6 mm. The three collections grew on habitats described as "short brush", "short brush on calcareous terraces", and "shale hill". The plants were generally rather short, wiry-stemmed, and had consistently spreading, diffuse inflorescences. The calyx and corolla tube lengths are the only differences by which var. *tamaulipana* differs from subsp. *polypremoides*. The stem and inflorescence characters of var. *tamaulipana* are similar to those of subsp. *polypremoides*; in fact, the Tamaulipan plants tended to have a closer resemblance to collections of subsp. *polypremoides* from the Davis Mountains, Jeff Davis County, Texas (e.g., *Rollins & Chambers 2759* [US]). Although var. *tamaulipana* occupies a distinct area to the south of collections of subsp. *polypremoides*, its morphological differences are minor and overlapping, and I prefer to synonymize it under the variable subsp. *polypremoides*.

Houstonia palmeri A. Gray (*Hedyotis palmeri* [A. Gray] W.H. Lewis)

This Mexican species occurs in Coahuila, Nuevo León, and San Luis Potosí (Terrell 1996). Turner (1995c) described var. *muzquizana* from the Múzquiz area of northern Coahuila. It differs from var. *palmeri* in having corolla tubes (6-)8-10 mm long and pedicels mostly 20-30 mm long, versus 4-5(-8) mm long and 5-20 mm long. In my treatment (1996) of *Houstonia palmeri* I recognized only one variable species, but commented (p. 94) that plants in the Múzquiz area have the longest corollas. Collections from the Múzquiz area that were formerly available to me did not seem sufficiently different from the many specimens from farther south to merit varietal status. Recent loans of var. *muzquizana* (two collections from TEX, one US) bear out Turner's measurements of corolla tube lengths, but show some overlapping in pedicel lengths in the two varieties. My presently limited sample leaves me reluctant to accept the existing morphological data as conclusive concerning var. *muzquizana*, pending further collecting of it.

Hedyotis nigricans (Lamarck) Fosberg, Lloydia 4:287. 1941.

The third species studied by Turner (1995a) belongs to *Hedyotis*, and was therefore not included in my *Houstonia* monograph. *Hedyotis nigricans* is a polymorphic species ranging from Ohio and Kentucky across the southeastern United States to Florida and the Bahamas, west to eastern Colorado and New Mexico, and south to central México. Terrell (1986; under *Houstonia*) provided a partial synonymy, and discussed two varieties occurring in Florida. Terrell (1991) summarized names and other data for the North American species of *Hedyotis*.

Hedyotis nigricans and several related species including *H. mullerae* Fosberg have non-crateriform, ellipsoid seeds with a centric punctiform hilum. Chromosome numbers in this group are known only for *H. nigricans* (x=9, 10). Seed morphology in the group differs distinctly from those of other Hedyotideae. The chromosome number of *Oldenlandia* is generally x=9, but this genus is quite distinct from *Hedyotis*.

Turner (1995a) established three new varieties in *Hedyotis nigricans*. Var. *austrotexana* differs in being papillose with "extended epidermal cells" on the calyces, stems, and leaves. Plants are simple-stemmed and non-bushy herbs 20-40 cm tall and occur in several counties in southern Texas. The var. *papillacea* from the panhandle and trans-Pecos Texas is similar to the preceding variety in the papillose vestiture, but the plants are sprawling low bushy herbs 5-15 cm. tall.

A few specimens of these varieties were lent to me from TEX, and the BRIT herbarium was visited in March, 1996. The characters, especially those concerning habit, separating these varieties seem to me to be minor. In the course of studying *Houstonia* species I have examined and collected many specimens of *Hedyotis nigricans* from Texas and elsewhere. Considering the great variability and wide range of *H. nigricans* I do not recognize the distinctness of these two varieties, and refer them to synonymy.

The third entity, var. *gypsophila* B.L. Turner, occurs in northern México. I have been familiar with these plants for some years, and would have described them as var. "*elliptifolia*", had I been less of a procrastinator. The variety has elliptical leaves and plants are consistently decumbent and short. Turner described the leaves as 3-6 mm wide, 2.5-3.5 times longer than wide, and the calyx as being setose with thickened hairs. I recognize this as a distinct variety. I was unaware of a preference of these plants for gypseous soils, as numerous collections recorded by me do not mention such soils.

Hedyotis pooleana B.L. Turner

Turner (1995d) described this new species from the Dead Horse Mountains, Brewster Co., Texas. It is closely related to *Hedyotis mullerae*, a low, compact, subshrub of Coahuila. I previously examined a number of specimens of *H. mullerae* from ASU, ENCB, GH, NY, TEX, and US. I have found *H. mullerae* to be rather variable in leaf size and shape, leaf vestiture, and compactness. Unfortunately, the only characters selected by Turner to distinguish *H. pooleana* have to do with the stem leaves, and these do not seem to be much different from some specimens of *H. mullerae*; consequently, I refer *Hedyotis pooleana* to the synonymy of the variable *H. mullerae*. Turner stated that the Dead Horse Mountains are an extension of the Sierra del Carmen of Coahuila, where *H. mullerae* is known to occur.

ACKNOWLEDGMENTS

I thank B.L. Turner, Director of TEX herbarium, for a loan of selected specimens. I am also grateful to the curators of the other herbaria cited in the text. I acknowledge helpful reviews by J. Henrickson and J.L. Reveal, and useful taxonomic data from Henrickson. This work was supported in part by Project F-12 of the Maryland Agricultural Experiment Station and Cooperative Extension Service.

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Phytologia (August 1996) 81(2):115-117.

VERNONIA BOQUERONA (ASTERACEAE), A NEW SPECIES FROM CHIAPAS, MEXICO

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ABSTRACT

Vernonia boquerona B.L. Turner, *spec. nov.*, from Cerro Boquerón, Chiapas, México, is described and pictured. It is reportedly an arching or clambering shrub to 3 m high, occurring on steep slopes with *Pinus*, *Quercus*, and *Ostrya* at about 2,255 m.

KEY WORDS: Asteraceae, Vernonieae, *Vernonia*, México, Chiapas, systematics

Vernonia (*s.l.*) is a large genus with about 60 species in México (Turner, in prep.). The present novelty was detected amongst a large collection of comps assembled by Dennis Breedlove from throughout México, all of these deposited at CAS.

VERNONIA BOQUERONA B.L. Turner, *spec. nov.* Figure 1. TYPE: MEXICO. Chiapas: "Steep slope with *Pinus*, *Quercus* and *Ostrya* on ridge NE of Cerro Boquerón on road from El Rosario to Niquivil," 2,255 m, 29 Nov. 1986, *D.E. Breedlove 66139*, with J. Sigg (HOLOTYPE: CAS!).

Similis *Vernoniae polypleurae* S.F. Blake sed frutex arcuatus aut scandens usque ad 2.5 m altus (vice fruticis aut arboris, rigide erectae, 3-15 m altae) est, foliis caulibusque adpressis-pubescentibus (vice dense hirsutorum), et capitulis cum 8-9 flosculis (vice 20-22).

Arching shrub or "vine" to 2.5 m high. Larger leaves linear-lanceolate to narrowly lanceolate-elliptic, mostly 7-12 cm long, 1.6-2.6 cm wide; petioles 3-10 mm long, gradually passing into the blade; blades pinnately nervate, the nerves prominent beneath, glabrate above, minutely pubescent to subglabrous below, the margins entire or nearly so, the apices acute. Heads arranged in rather compact to broadly diffuse terminal corymbose panicles, the branches appressed-pubescent, clearly somewhat arcuate with the heads arranged along one side, sessile and ebracteate, the distance

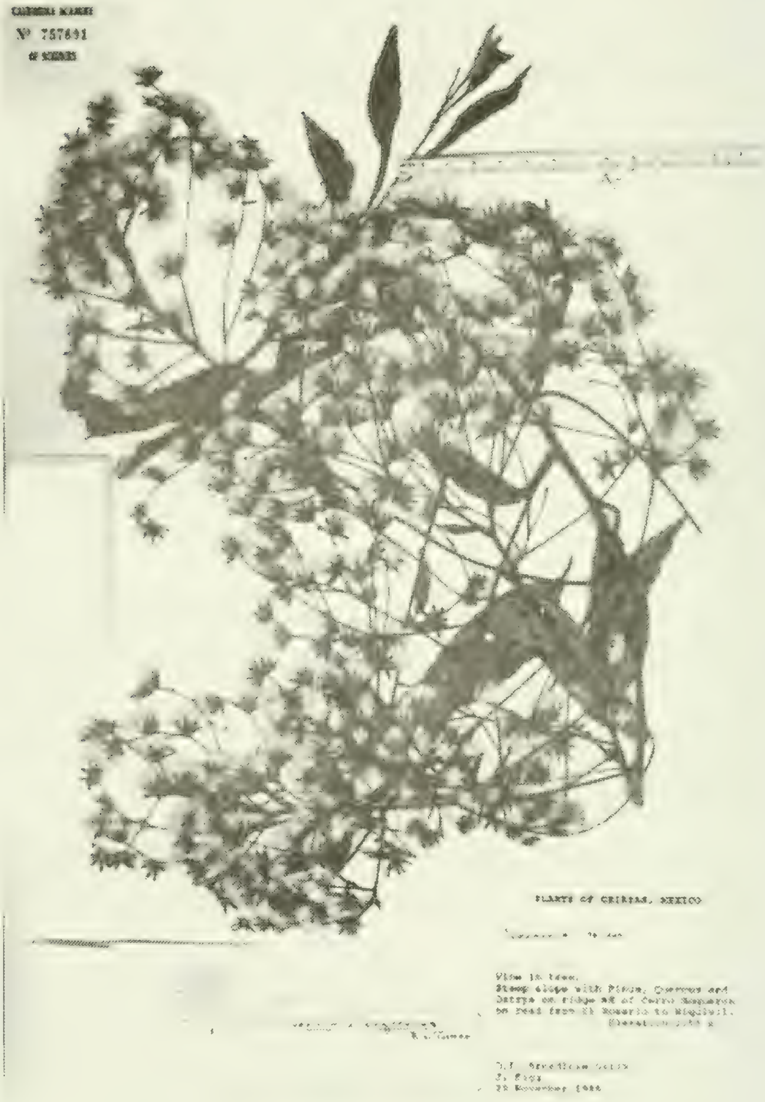

Figure 1. *Vernonia boquerona* type specimen.

between heads mostly 1-4 cm. Involucres turbocampanulate, 7-8 mm high, the bracts 3-4 seriate, graduate, the inner series appressed-pubescent with silky hairs. Corollas purple, ca. 7 mm long, the lobes ca. 3 mm long. Achenes 8-9 per head; body somewhat 4-sided, ca. 4 mm long, 0.7 mm wide, pubescent throughout with ascending hairs; pappus double, an inner series of ca. 40 dirty-white persistent bristles ca. 6 mm long, an outer series of ca. 30 scales ca. 1 mm high.

ADDITIONAL SPECIMEN EXAMINED: same collectors, site and date as the holotype but collection number *66118* (CAS,TEX!).

The holotype has a very large open capitulescence (ca. 30 cm wide and as high), while *Breedlove 66118* has a much more compact capitulescence (ca. 14 cm wide, and as high), otherwise the two collections are very similar.

Vernonia boquerona has the general capitulescence and heads of *V. polypleura*, but differs markedly from the latter in habit, pubescence and florets per involucre, as noted in the above diagnosis. The latter species occurs in the same general region as *V. boquerona* but at seemingly lower elevations in wetter sites (mostly 1,200-2,200 m in montane rainforests based upon data from eleven sheets at LL, TEX).

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Ted Delevoryas for reviewing the paper.

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AGERATINA BOBJANSENII (ASTERACEAE: EUPATORIEAE), A NEW SPECIES FROM DURANGO, MEXICO

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ABSTRACT

A new species, ***Ageratina bobjansenii*** B.L. Turner, is described and illustrated from Durango, México. It belongs to the subgenus *Neogreenella* and is known only from holotypic material, this collected in pine-oak forests in the vicinity of Cd. Durango.

KEY WORDS: Asteraceae, Eupatorieae, *Ageratina*, México, Durango, systematics

Identification of a large assemblage of Mexican Asteraceae assembled by D.E. Breedlove from throughout México (ca. 500 sheets [CAS]) has revealed the following novelty.

AGERATINA BOBJANSENII B.L. Turner, *spec. nov.* Figure. 1. TYPE: MEXICO. Durango: "Rocky bluffs near Puerto Buenas Aires SW of La Ciudad in forest of *Pinus, Quercus* and *Arbutus*," 2680 m, 7 Dec 1991, *D.E. Breedlove & C. Burns 72708* (HOLOTYPE: CAS!).

Similis *A. zunilanae* B.L. Turner sed habens folia ovata eglandulataque (vice foliorum cordatorum glandulatorumque) et involucra parviora ca. 5 mm alta (vice 6.5-8.5 mm).

Stiffly erect simple-stemmed perennial herbs 50-60 cm high, the midstem internodes much longer than the leaves. Midstems moderately pubescent with short glandular hairs 0.02-0.03 mm high. Leaves opposite throughout, those at midstem mostly 6-9 cm long, 3-4 cm wide; petioles 2.5-3.5 cm long; blades broadly ovate to somewhat deltoid, 3-nervate from the base, sparsely puberulent with eglandular hairs, mostly along the edges and veins, the margins crenulodentate. Heads numerous, arranged in a terminal capitulescence with strictly ascending branches, the ultimate peduncles 5-10 mm long, densely glandular-pubescent like the stems. Involucres narrowly campanulate, ca. 5 mm high, 2-3 mm wide (pressed); bracts 2-seriate, linear-

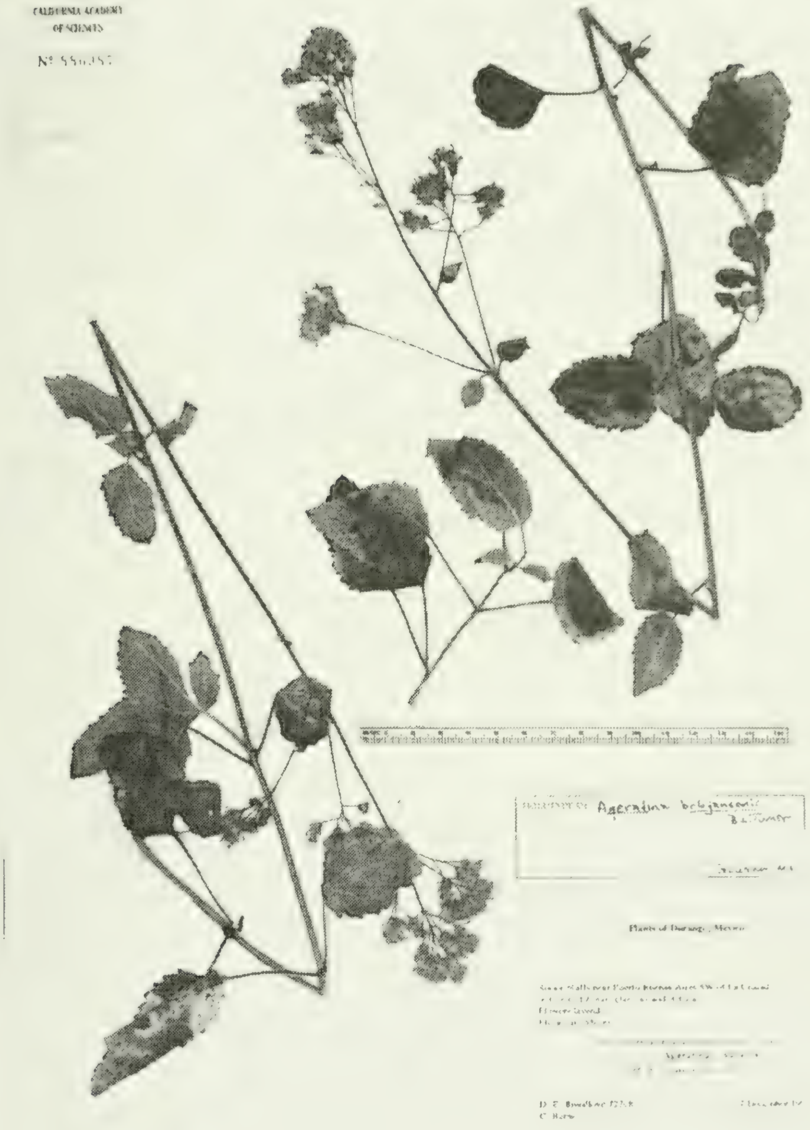

Figure 1. *Ageratina bobjansenii*, from holotype

lanceolate, eximbricate. Receptacle plane, glabrous. Florets 14-16 per head (two counts); corollas 5-6 mm long, pinkish-lavender, glabrous throughout, the tube ca. 3 mm long, gradually tapering into the throat. Achenes ca. 2.5 mm long, sparsely ciliate; pappus of ca. 30 uneven ciliate, rather fragile bristles 3-5 mm long, the cilia mostly longer than the axis of the bristles.

This species belongs to the large subgenus *Neogreenella* (ca. 100 species in México) and will key to or near the Chiapasan species, *Ageratina zunilana* B.L. Turner, in the treatment of *Ageratina* in México by Turner (1997). It differs from that species in being strictly herbaceous (50-60 cm high, vs. suffruticose or shrubby and ca. 1 m high), having mostly ovate, glandular-pubescent leaf blades (vs. cordate and eglandular), and smaller involucres (ca. 5 mm high vs. 6.5-8.5 mm).

There already being an *Ageratina breedlovei* King & H. Rob, I take pleasure in naming this novelty for my esteemed colleague Bob (Robert) Jansen, well known synantherologist currently engaged in studies on the phyletic relationships of comps generally, mainly using DNA data, but who, early on, produced a fine monographic study of the difficult genera *Spilanthes* and *Acmella* (Jansen 1981, 1985).

ACKNOWLEDGMENTS

I am grateful to Gayle Turner for the Latin diagnosis, and to her and Justin Williams for reviewing the manuscript.

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Phytologia (August 1996) 81(2):121-123

PRIONOSCIADIUM SARAVIKI (APIACEAE): A NEW SPECIES FROM THE SIERRA MADRE OCCIDENTAL, MEXICO

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ABSTRACT

Prionosciadium saraviki is a previously undescribed species of the family Apiaceae. It is related to *Prionosciadium townsendii* but different from that species in several respects, primarily its yellow flowers, smaller fruits, and dentate rather than crenate leaves.

KEY WORDS: Apiaceae, *Prionosciadium*, México, Chihuahua, systematics

RESUMEN

Prionosciadium saraviki es nueva especie de la familia de las Apiáceas. Es emparentada a *Prionosciadium townsendii* pero difiere por tener flores amarillas, frutas más pequeñas, y hojas dentadas en vez de crenadas.

PALABRAS CLAVE: Apiáceas, *Prionosciadium*, México, Chihuahua, sistematica

Prionosciadium saraviki Laferrière is a previously undescribed species of the carrot family, called "saravique" or "saraviqui" by the Mountain Pima Indians of the Sierra Madre of Chihuahua, México. The plant grows in moist, shaded locations in its native habitat, which is a pine/oak forest with sabino (*Cupressus lusitanica* Mill.) frequent along creekbanks. The plant is valued for its edible root, which is white with a thin, papery, copper-colored periderm. The Mountain Pima scrape off the skin and stick the remainder of the root directly into the fire to roast it.

As with many other umbellifers, saravique is a semelparous perennial. The first four or five years of its life, it produces only one or two leaves, each of which is up to 90 cm across. When conditions are right, it forms a flowering stalk up to 3 m high, bearing hundreds of tiny yellow flowers. During 1987, a year of adequate rainfall, approximately 20-30% of the total population was in bloom; the following year, a region was subject to an extreme drought, and as a result the only individual blooming was one located in a permanent spring. The entire plant (including the root) possesses a very pleasant aromatic fragrance. Saravique is becoming rare in its native habitat due to overutilization and overgrazing.

In previous publications (Laferrière 1992, 1994a,b; Laferrière, *et al.* 1991), I referred to the plant as *Prionosciadium townsendii* Rose. Further examination, however, reveals saraviqui to be different from that species in several respects, primarily its yellow flowers, smaller fruits, and dentate leaves. *Prionosciadium townsendii* has purple flowers and crenate leaves. The Nabogame collections are therefore described below as a new member of the Apiaceae.

Prionosciadium saraviki Laferr., *spec. nov.* TYPUS: MEXICO. Chihuahua: Municipio Temósachi, 2 km N of Nabogame, in spring on grassy sunlit hillside, 18 km NNW of Yepachi, 28° 30′ W, 108° 35′ N, 1900 m, in flower, 27 Jul 1988, *Laferrière 1569* (HOLOTYPE: ARIZ; Isotypes: ANSM,MEXU,UC).

E *Prionosciadio townsendii* Rose floribus luteis, foliis dentatis et fructibus 4-8 mm longis differt.

Plant semelparous, perennial, to 150 cm tall when fertile, bearing a pleasant aroma. Roots tuberous, with a pure white interior and a thin, papery, copper-colored periderm. Stems slightly reddish, waxy, to 4 cm in diam at base. Basal leaves of vegetative specimens 1-2, pentoid to deltoid in outline, pinnate, winged between leaflets, to 90 cm long, to 80 cm wide; leaflets pinnately lobed, the lobes lanceolate, dentate; petiole and rachis round, hollow. Upper cauline leaves opposite or whorled, ternate or simple, with short, broad sheaths. Inflorescence of several verticils of peduncles; peduncles slender, 1.5-6.0 cm long, subtended by a pair of leaves, scaberulous at the summit; involucre wanting, or of a single filiform bract 5-10 mm long; involucel of several filiform bractlets 5-8 mm long, longer than the flowers but shorter than the fruit; fertile rays 8-16, spreading or divaricate, subequal, 1.5-4.0 cm long; fertile pedicels 2-5, 3-7 mm long; calyx teeth obsolete; flowers yellow; ovary glabrous; petals inrolled at anthesis; anthers medially attached. Fruit oblong, truncate at the apex, retuse at the base, 4-8 mm long, 3-5 mm across, the dorsal ribs prominent, the lateral broadly thin-winged, the wings narrower than the body; oil tubes 2 or 3. Seeds nearly terete.

Paratypes: 2 km N of Nabogame, same individual as holotype, in fruit, 20 Oct 1988, *Laferrière 2156* (ARIZ); Nabogame, vegetative leaves only, 11 Jul 1988, 1800 m, *Laferrière 1504* (ANSM,ARIZ,MEXU); Nabogame, in flower, 1800 m, 28 July 1987, *Laferrière 535* (CHAPA,TEX,UC).

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TAXONOMIC VALUE OF CULM ANATOMICAL CHARACTERS IN THE SPECIES OF *BOUTELOUA* LAGASCA (POACEAE: ERAGROSTIDEAE)

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ABSTRACT

The study of anatomical characters in the culm epinodal zone of 41 species and sixteen varieties of *Bouteloua* has been completed. Worthless taxonomic characters were found in this region, nevertheless, five anatomical patterns were characterized. Other regions of the culm were explored for a possible later study.

KEY WORDS: *Bouteloua*, Poaceae, anatomy, systematics

RESUMEN

Se llevó a cabo un estudio de los caracteres anatómicos en la zona epinodal del tallo de 41 especies y diesiseis variedades del género *Bouteloua*. Se encontraron caracteres de escaso valor taxonómico en esta región del tallo, no obstante, se caracterizaron cinco patrones anatómicos diferentes. Se complementó el estudio con observaciones en otras regiones del tallo, para un posible estudio posterior.

PALABRAS CLAVE: *Bouteloua*, Poaceae, anatom'a, sistematica

INTRODUCTION

Systematic studies in plants are becoming more important up to date. From their results we can get a knowledge closer to the reality about evolution of the plants and their phylogenetic relationships, particularly in those species with any kind of importance. This is the case of the *Bouteloua* species, which are some of the most important native grasses in North American grasslands because of their great forage quality, their resistance to heavy livestock, and wide distribution. Species of *Bouteloua* were once the dominant components in the Mexican grasslands at the beginning of this century. However, in spite of being considered the producers of high quality beef in free-ranging livestock, their biology and taxonomy are not well defined until now, and the confusion in species definition remains. This genus has been studied totally or partially by: Griffiths (1912); Hitchcock (1920, 1935, 1939); Swallen (1939); Gould (1968, 1969, 1975, 1979); Gould & Kapadia (1964), and Roy (1968). All those studies were morphological taxonomic studies more than systematic ones. Gould, *et al.* incorporated chromosomal information in addition to morphological data, but no other kinds of features have been studied in this genus in order to get an exact inference related to the evolution of its taxa. Columbus (1996) studied in his Ph.D. research, some aspects of a systematic study in this genus, together with other related genera. The topic of his research was the anatomy of leaf sections and molecular DNA in *Bouteloua* and genera related. From these two features he reached a conclusion about the phylogeny of the tribe Bouteloumeae in America. In other studies, Herrera and colleagues began research to study basic features such as anatomy in leaf epidermis and culm sections, flavonoid profiles, and physiographic requirements for the development of the Mexican taxa.

The present study is part of an ongoing project "A biosystematic study of the genus *Bouteloua* from México." At the same time it pretends to contribute to the Columbus research of *Bouteloua* from America. The particular objective of this project is to characterize worthy anatomical features from culm sections in the taxa of *Bouteloua*, in order to add data to support the better understanding of its phylogenetic relationships.

It is widely known that anatomical studies in leaf sections add to the general knowledge of the plants with good results (Ellis 1976; Columbus 1996; Herrera & Grant 1994; Aiken, *et al.* 1984). However, there are few studies of culm anatomy, none in *Bouteloua*. Authors like Sánchez (1983a, 1983b), Ebinger & Carlen (1975), Auquier & Somers (1967), and De Wet (1960) have generated anatomical data from culm sections in several grass genera other than *Bouteloua*. All these authors agree about the phylogenetic value of culm anatomy, in addition to other features at the supraspecific level.

MATERIALS AND METHODS

The culm sections studied here were made in the proximal node area (epinodal zone) in 41 species and sixteen varieties of *Bouteloua* from America, all of them from fresh collections done by Columbus (1996) (all the taxa with numbers in this work, e.g., *B. alamosana* [2418]) in México and other countries in America. Complementary fresh material collected by Herrera and colleagues., as well as herbarium specimens of rare species were used. Three hundred permanent slides with four to six repetitions per species, were done at the Anatomy Laboratory of Rancho Santa Ana Botanic Garden, Claremont, Calif. The sections were cut at exactly the basal portion of the central internode of well developed culms, then processed as follows:

Desilicification: 30% Hydrochloric acid was used for 48 hrs to remove silica from culms.

Dehydration: was in several consecutive steps of 1 hr each, in ethanol at different concentrations (30%, 50%, 70%, 90%), then 100% + 1% safranine to dye the tissues and to facilitate the inclusion and sectioning, then 100% ethanol alone.

Clearing: consecutive steps 1 hr each were done in the following solutions: 2:1 ethanol: xylene, 1:2 ethanol: xylene, 100% xylene twice.

Impregnation: 1:1 Xylene: paraffin oil, 2 hrs; Paraffin at 58° C, 6 hrs, twice.

Inclusion: was done in a special device to include tissue in the position required to make slices.

Paraffin blocks with the tissue included were placed in a softener (10% aerosol OT: glycerine: water 10:3:90) from Schmid & Turner (1977), during two days in order to facilitate slicing. Blocks then were placed on ice at least 1 hr, then sliced with a Spencer 820 microtome. Slices of 10 μm thickness were cut, then dyed following the Sharman (1943) procedure. Finally, the analysis and description of the anatomical characters was done.

To get a comparative picture of the culm in *Bouteloua*, other regions than the epinodal were observed; these included the nodal zone and the central part of the internode. Fresh material from specimens collected in several parts of México by the collaborators of this project were used to analyze the differences and to validate the characters from other culm levels.

RESULTS

The analysis of the fixed slices and the fresh slices permitted observation of the anatomy of the epinodal zone, as well as the nodal and central part of the internode (Figure 1), where it is possible to find several kinds of cells, organized in different ways, forming defined patterns depending primarily on the maturity and level of the culm. The main types of cells found are:

epidermal cells (Figure 2.1), associated with silica cells, trichomes and stomata;

parenchyma cells, thin walled large cells which can form a medullar parenchyma (Figure 2.2), a subepidermal ring in the nodal region, or radial rachymorph parenchyma cells (chlorenchyma) which are responsible for culm photosynthesis (Figure 2.3), always placed perpendicularly to the epidermal surface and associated with the Kranz cells;

sclerenchyma cells (Figure 2.4), thick walled cells with a small lumen forming subepidermal rings and generally surrounded by the vascular bundles, making them more conspicuous at the apex;

intermediate cells (Figure 4.1), morphologically intermediate cells which share features from both parenchyma and sclerenchyma cells, very abundant in the culm and difficult to define, they form subepidermal rings in proximal parts of the node, or they can be mixed in the sclerenchyma ring. Some authors mention collenchyma cells in the culm, they are probably referring to this type of cells (Sánchez 1981);
mestome cells (Figure 6.4), thick walled cells that completely surround the peripheric vascular bundles and the interior ones, they can be variable in size, number, and shape, and occasionally they look like sclerenchyma cells;
vascular bundles, can be internal (IVB, Figure 3.1) or peripheral (PVB, Figure 3.2), the former are in the interior part of the culm and are primary vascular bundles (Figure 3.3), occasionally secondary vascular bundles (Figure 3.4), while the later (PVB) can be secondary or even tertiary vascular bundles (Figure 3.5). Generally in well differentiated culm zones, the PVB are tertiary and are associated with Kranz cells and photosynthetic parenchyma, while in the immature zones the PVB are secondary vascular bundles;
Kranz cells (Figure 3.6), large conspicuous cells, thin walled, associated with tertiary vascular bundles, in the exposed mature zones of the internodal sheath. These cells together with the radial rachymorph chlorenchyma form a system called Kranz syndrome (Sánchez 1979), this system (Figure 3.7) is associated with the C_4 photosynthetic process.

Anatomical description of the culm internode at several levels

Epinodal zone. Analysis of epinodal zone slides showed a rounded to oval transection, with smooth to lightly undulating outline. This culm zone of *Bouteloua* resulted in a very variable region for anatomical characters, however, it was possible to observe five well defined patterns in this zone, which are variable if the level of section is moved within just a few millimeters.

1. Subepidermal ring of intermediate cells without sclerenchyma. The subepidermal ring of intermediate cells which bound the PVB, these generally are secondary VB, in some species showing an incipient Kranz system, the IVB are in one or several levels and can be primary or secondary VB. The number and size of the VB is variable among the species. Species containing this pattern are: *Bouteloua alamosana* [2418], *B aristidoides* var. *aristidoides* [2133, 2217], *B. disticha* [2376], *B. gracilis* [2223], *B. media* [2367, 2420], and *B. rigidiseta* [2231] (Figure 4).

2. Subepidermal ring of intermediate cells bounding a sclerenchyma ring. The subepidermal ring of intermediate cells show the internal margin undulated, with 3 to 4 cells of thickness in the widest part, and two in the narrower. This ring surrounds a sclerenchyma ring of two cells thickness that joins the VB, the PVB are totally included, they generally are II°, and bound the external portion the IVB can be primary or secondary. An incipient Kranz system is present in some samples. Species with this pattern are: *Bouteloua alamosana* [2301], *B. barbata* var. *barbata* [2268], *B. chondrosioides* [2422], *B. curtipendula* var. *caespitosa* [2213, 2326], *B. disticha* [2393], *B. elata* [2366], *B. eriostachya* [2286], *B. media* [2367, 2387], *B.*

chihuahuana [2289], *B. rigidiseta* [2231, 2233], *B. simplex* [2278], *B. triaena* [2338, 2357], and, *B. williamsii* [2419] (Figure 5).

3. Subepidermal ring of sclerenchyma alternated with intermediate cells. The subepidermal ring of sclerenchyma is variable in thickness, it surrounds the PVB and borders the external margin of the IVB, alternating with irregular zones of intermediate cells in some slides, where the ring is interrupted by Kranz cells with associated radial parenchyma. Species presenting this pattern are: *Bouteloua annua* [2433], *B. aristidoides* var. *aristidoides* [2359], *B. barbata* var. *barbata* [2229, 2268], *B. disticha* [2360], *B. elata* [358], *B. eludens* [2274], *B. eriopoda* [2127, 2214], *B. gracilis* [2340], *B. hirsuta* [2342], *B. parryi* var. *parryi* [2351], *B. reflexa* [2436], *B. scorpioides* [2200], *B. simplex* [2335], *B. trifida* [2126], and *B. williamsii* [2353] (Figure 6).

4. Ring of intermediate cells of sclerenchyma only in the top of vascular bundles. The ring of intermediate cells totally surrounds the PVB (generally II°) with 3 to 6 thicknesses of cells, and borders the IVB only in the top. The sclerenchyma cells surround the VB in the top. Species presenting this pattern are: *Bouteloua annua* [2434], *B. hirsuta* var. *hirsuta* [2284], *B. megapotamica* [28393], *B. parryi* var. *gentryi* [2369], *B. repens* [2123], and *B. vaneedenii* [2542] (Figure 7).

5. Culm with well defined Kranz system. The sclerenchyma ring of variable thickness, interrupted by a variable number of Kranz cells like a crown, radial parenchyma is always associated, IVB in one or many levels. Species presenting this pattern are: *Bouteloua aristidoides* var. *aristidoides* [2217], *B. barbata* var. *rothrockii* [2215], *B. curtipendula* var. *tenuis* [2352], *B. pedicellata* [2408], *B. ramosa* [2287], *B. repens* [2350, 2396, 2425], and *B. triaena* [2401] (Figure 2).

Observations done at nodal and internodal zones from fresh sections of some *Bouteloua* species resulted as follows:

Nodal zone. The nodal culm region presents a circular and smooth transection with a subepidermal variable thickness parenchyma ring surrounding a thick sclerenchyma ring. The sclerenchyma ring links the VB's which are very close to each other. An unclear definition of the parenchyma ring and the VB's is found in the initial node zone; sheath and culm are not well differentiated in this particular zone, appearing like a unit (Figure 8). This pattern is present in complete sequences of *Bouteloua breviseta* [2279] and *B. rigidiseta* var. *rigidiseta* [2231]. A different pattern in the same section level with external and internal sclerenchyma rings was found in two other species: *B. karwinskii* [2208] and *B. johnstonii* [2285], where two rings of sclerenchyma are present, one external surrounding the parenchyma ring and another internal linking the undefined VB's.

Examined species: *Bouteloua aristidoides* var. *aristidoides* [2279], *B. barbata* var. *barbata* [2318], *B. breviseta* [2279], *B. chasei* [2197], *B. chondrosioides* [2184], *B. curtipendula* var. *caespitosa* [2177], *B. eludens* [2272], *B. gracilis* [2201], *B. hirsuta* [2216], *B. karwinskii* [2208], *B. media* [2367, 2387], *B. pectinata* [2823], *B. purpurea* [2343], *B. radicosa* [2318], *B. ramosa* [2137], *B. rigidiseta* var. *rigidiseta* [2231], *B. scorpioides* [2320], and *B. uniflora* [2319].

Mid internodal zone. According to the observations from fresh or herbarium material slices, the anatomical pattern in this culm level (always devoid of sheath), seems to be constant in all the superior half of the internodal zone, it matches with the Auquier & Somers (1967) description of a chloridoid type. There exist few variations depending on the species, mainly related to the number and position of the VB's, and the sclerenchyma ring thickness. The observations made in this zone were aimed at establishing differences among the anatomical features from the epinodal and the internodal zones, as well as to find important systematic characters. The description of this pattern is shown as follows (Figure 3). Transections oval to round with smooth to undulate outline, epidermis with square or round cells, few trichomes and stomata opening to the radial chlorenchyma. The subepidermal zone shows a continued sclerenchyma ring, interrupted by the Kranz system, this ring consists of 3 to 8 cells in thickness, surrounding the PVB, and bounding only the IVB top margin. The Kranz system with 4 to 8 crown shaped cells on the radial parenchyma, associated with the III° VB; sclerenchyma girder associated with the PVB; VB's variable in number and position according to the species, PVB's in this zone are mostly III° with clearly associated Kranz system; IVB's can be distributed in one or several levels, they generally are I°, sometimes II°. The IVB's are always surrounded by their mestome sheath, which can have a single or double layer at the bottom.

Examined species: *Bouteloua alamosana* [*Herrera & Siqueiros 1319*] (CIIDIR), *B. aristidoides* var. *aristidoides* [*Rosales s/n*] (HUAA), *B. barbata* var. *barbata* [*Siqueiros s/n*] (HUAA), *B. barbata* var. *sonorae* [*Herrera & Siqueiros 1309*] (CIIDIR), *B. chondrosioides* [*Herrera 1402*] (CIIDIR), *B. curtipendula* [*Herrera 1324*] (CIIDIR), *B. elata* [*Herrera 1465*] (CIIDIR), *B. parryi* [*Herrera & Siqueiros 1315*] (CIIDIR), *B. pedicellata* [*Rzedowski 44714*] (IEB), *B. quiriegoensis* [*Herrera & Siqueiros 1320*] (CIIDIR), *B. radicosa* [*Herrera 1469*] (CIIDIR), *B. reflexa* [*Herrera & Siqueiros 1311*] (CIIDIR), *B. uniflora* [*Herrera & Siqueiros 1307*] (CIIDIR), and *B. williamsii* [*Herrera 1300*] (CIIDIR).

DISCUSSION

The study of the *Bouteloua* culm anatomy resulted in two main problems: the enormous anatomical variation at different levels, and the confusion and lower definition of some tissue cells. Metcalfe (1960) suggested that culm anatomy has a limited taxonomic value, because of the variation at different levels, a theory which has been corroborated by the results of this work, in the epinodal part of the *Bouteloua* culm.

Anatomical features in the epinodal zone cannot be considered as key characters to add in the delimitation of *Bouteloua* species, neither in the determination of phylogenetic position; since it is a culm meristematic region, with different patterns at different levels. The five more stable patterns described in the results were based on the presence or absence and position of the sclerenchyma cells, as well as on the position of the ring of intermediate cells. The general observance for all the species is the presence of immature tissues (not completely differentiated) and a ring of intermediate cells bordering the VB's, which is replaced by sclerenchyma cells far away from the node, Kranz cells are not present in this region. The VB's seem to be very mature in this zone, without variation from one region to another. It is difficult to establish a specific pattern inside the populations of one species, they commonly present intermediate schemes. The task of trying to assemble taxa related by anatomical features, and to compare them with phylogenetic groups previously established by Columbus (1996), did not succeed. Different taxa having the same pattern of culm anatomy do not represent close relationship (morphological, DNA content or leaf anatomy features). Unexpectedly, more than one culm anatomic pattern may be found inside populations of a single species, e.g., *B. alamosana* [2418] shows pattern # 1, while [2301] shows pattern # 2; *B. disticha* [2393] has pattern # 2, and [2360] has pattern # 3. This is probably due to millimetric differences in the level of cutting.

Unexpectedly, the nodal zone was less variable, showing a specific anatomic pattern, which is easy to distinguish because it is very diffuse and the VB's are very close to each other, and formed a continuous ring of schlerenchyma which surrounds the entire VB. A subepidermal ring of parenchyma is often present, it rarely shows two sclerenchyma rings as observed in *Bouteloua karwinskii* and *B. johnstonii*. This nodal pattern changed towards upper levels, firstly substituting the typical parenchyma ring of this region for a ring of intermediate cells with a different arrangement (as commented above); then, in a higher level, this ring of intermediate cells was changed for sclerenchyma cells and the Kranz cells started showing up. The first cells appeared laterally placed, one on each side of the PVB, then two on each side, and so on until they completed a crown in the apex of the PVB. The complete crown was present at the uncovered zone of the sheath which corresponds to the central part of the internode. Kranz cells were always associated with the radial parenchyma, which depending on the species can be conspicuous to inconspicuous. The presence of a mature Kranz system in this part of the culm, was probably due to the direct solar exposure, since it was devoid of the sheath protection at this portion, as Sánchez (1979, 1981) stated. At this culm level the resulting pattern remained constant in the reviewed populations.

It is necessary to underline that the present study was based on the epinodal culm features, whose permanent slides were all done. The observations from higher levels of the internode were done with fresh material, so that the quality was much lower, and no key characters were determined, nevertheless it was possible to make general descriptions of the principal patterns. The number of repetitions per species was not enough to make generalizations, however, it was possible to get a precise idea of the culm anatomy in this particular region. It is obviously necessary to make a future study of the anatomical variation at the central part of the culm internode.

In spite of the good fixed slides obtained in this work, sometimes it was impossible to define the cells corresponding to the kind of tissue in observation, especially in the epinodal zone, due to the intermediate cells mentioned and described above, which are morphologically intermediate between parenchyma and sclerenchyma cells, *e.g.*, the cell wall thickness and the size. These cells have been catalogued by other authors as collenchyma cells (Sánchez 1984; De Wet 1960), or as tissue in transition or parenchyma in transition (Sánchez 1979, 1983a, and 1983b). Stevenson & Mertens (1980) stated that the collenchyma and the parenchyma are physically alike, since they both are bearing living and active protoplasts surrounded by primary walls, differing in the wall thickness and the length of the cells. The close relationship between these two tissues is very evident in the culms. Esau (1972) stated that in the adjacent region of collenchyma and parenchyma, there exist cells in transition, which share features from both cell types. Metcalfe (1960), mentions that there is frequently a transition between thin walled parenchymatous cells and thicker walled prosenchyma (sclerenchyma) cells. This transition can be gradual or abrupt and sometimes it is difficult to define the kind of cells under observation. Tissue in transition or intermediate cells are more common in the undifferentiated culm regions, where it is possible to find this tissue forming subepidermal rings, continuous or alternating with other tissues like sclerenchyma. When the alternating tissue is parenchyma, it is difficult to define its boundaries. The parenchyma cells from the culm anatomy are clearly defined as a radial parenchyma associated with the Kranz structure and to the medulla cells when present.

During this exhaustive review of culm anatomical characters, searching for similarities and dissimilarities to define the taxonomic relationships, quite variable features were found at intra and interspecific level, *e.g.*, the position of the ring of intermediate cells is not constant in the same individual at different culm levels; and also in different species. On the other hand, some features remain constant in the same species, but with minor variation between different species; that is the case of the VB's which present very low ranges of interspecific variation.

Lastly, it is important to remark that the information generated by this study will be taken as part of the biosystematic study of the genus, and even though the initial hypothesis was not corroborated, the data generated are worthy, and contributes to the general knowledge of the genus *Bouteloua*.

CONCLUSIONS

The main conclusion from this work is that the anatomic features from the epinodal culm zone in the taxa of *Bouteloua*, cannot be considered good systematic characters, because of the extreme variation presented. However, the central internodal zone seems to be much more constant, unless additional studies suggest different conclusions.

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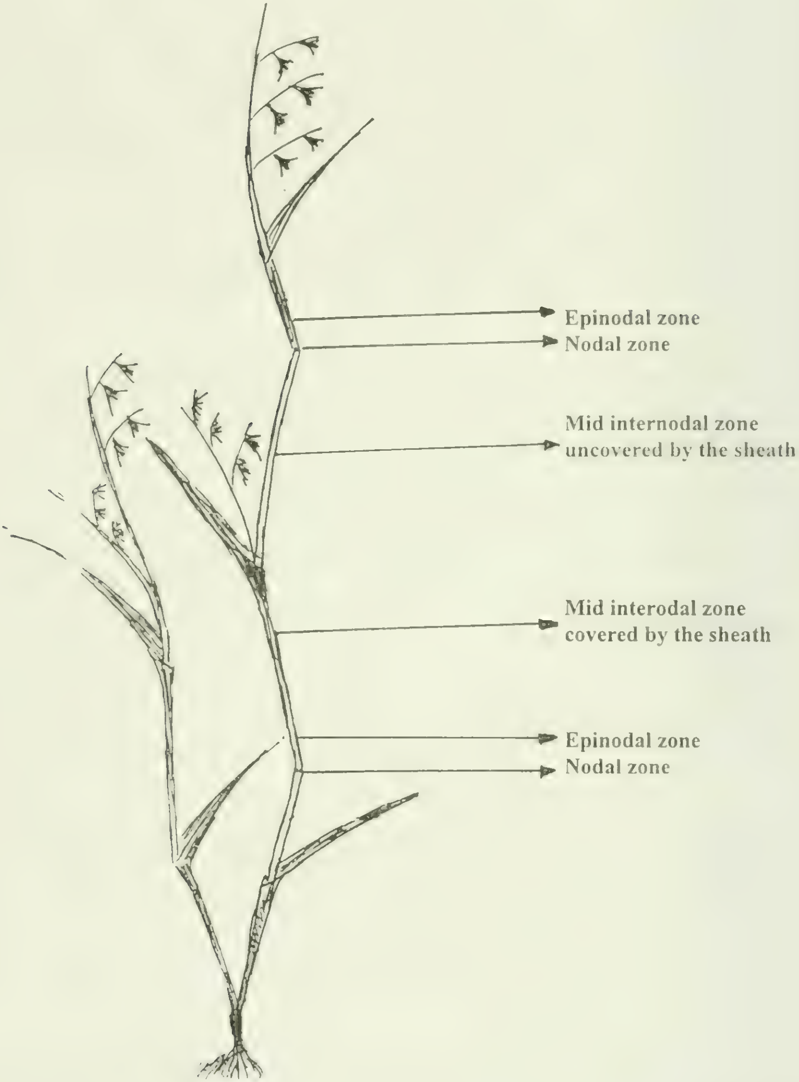
Epinodal zone
Nodal zone
Mid internodal zone uncovered by the sheath
Mid interodal zone covered by the sheath
Epinodal zone
Nodal zone

Fig. 1. Levels of culm sliced to observe: Nodal zone. Epinodal zone. Mid internodal zone

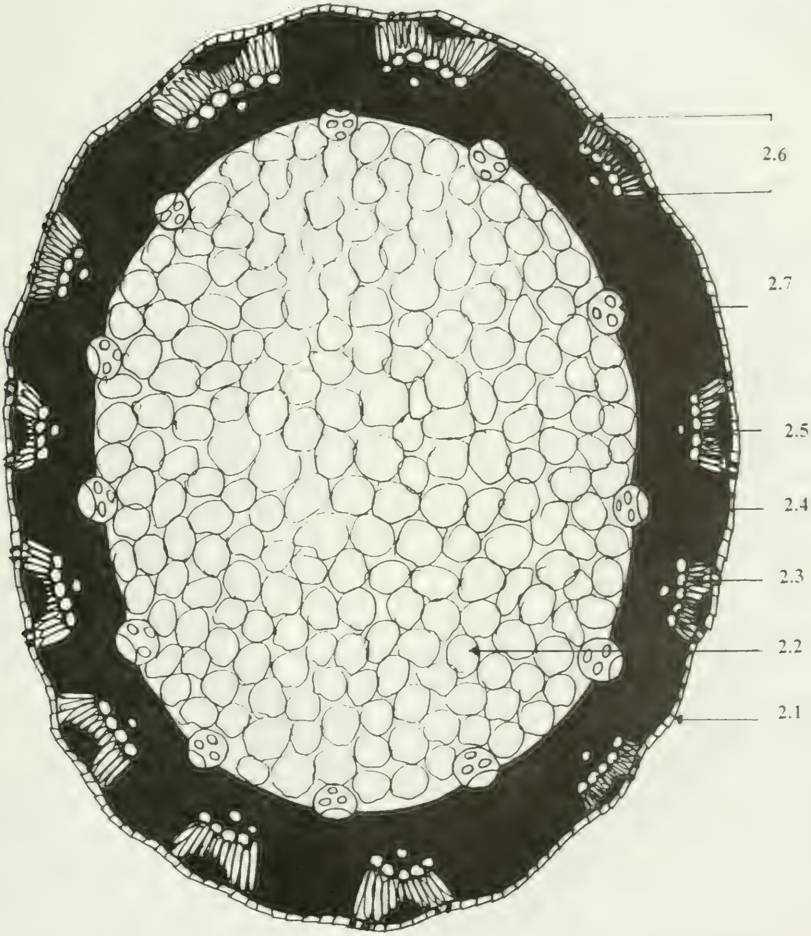

Fig. 2. Bouteloua uniflora Vasey. Culm transversal section at the mid internodal zone. 2.1) Epidermis. 2.2) Medullar parenchyma cells. 2.3) Radial parenchyma cells. 2.4) Sclerenchyma. 2.5) Vascular bundles. 2.6) Kranz system. 2.7) Internal vascular bundles.

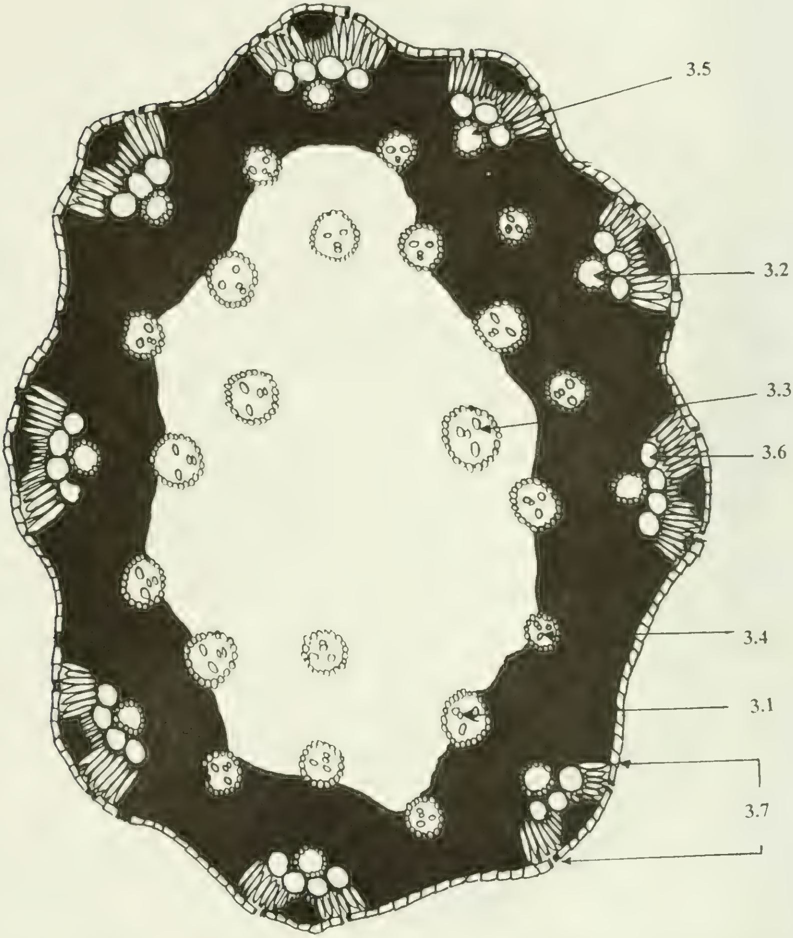

Fig. 3. Bouteloua pedicellata Swallen. Culm transversal section at the mid internodal zone. 3.1) Internal vascular bundles (IVB). 3.2) Peripheral vascular bundles. 3.3) Primary vascular bundles. 3.4) Secondary vascular bundles. 3.5) Tertiary vascular bundles. 3.6) Kranz cells. 3.7) Kranz system.

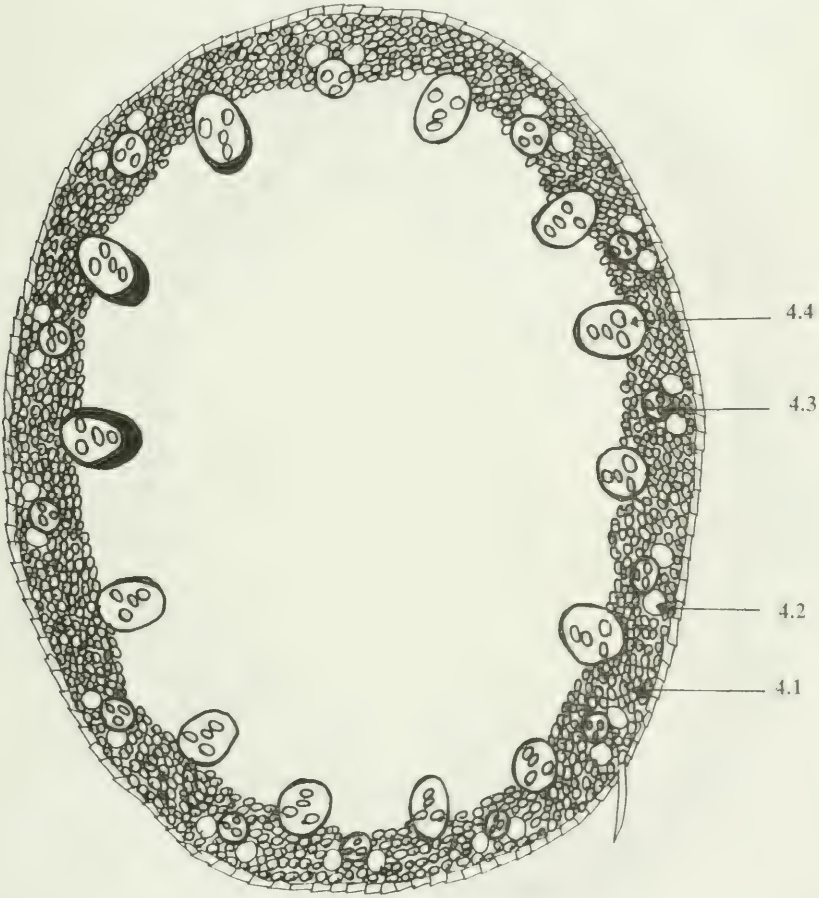

Fig. 4. Bouteloua alamosana Vasey. Culm transversal section at the epinodal zone. Subepidermal ring of intermediate cells without sclerenchyma. 4.1) Intermediate cells. 4.2) Kranz cells. 4 3) Secondary peripheral vascular bundles. 4.4) Internal vascular bundles.

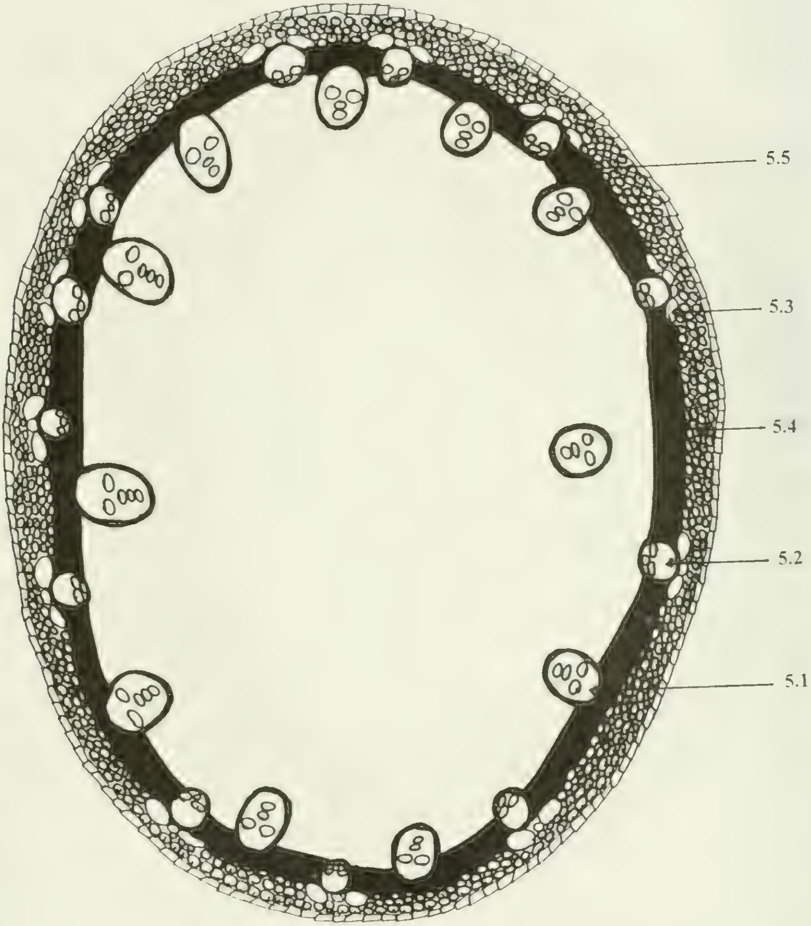

Fig. 5. Bouteloua alamosana Vasey. Culm transversal section at the epinodal zone. Subepidermal ring of intermediate cells surrounding a ring of sclerenchyma. 5.1) Primary vascular bundles. 5.2) Secondary vascular bundles. 5.3) Kranz cells. 5.4) Ring of intermediate cells. 5.5) Ring of sclerenchyma.

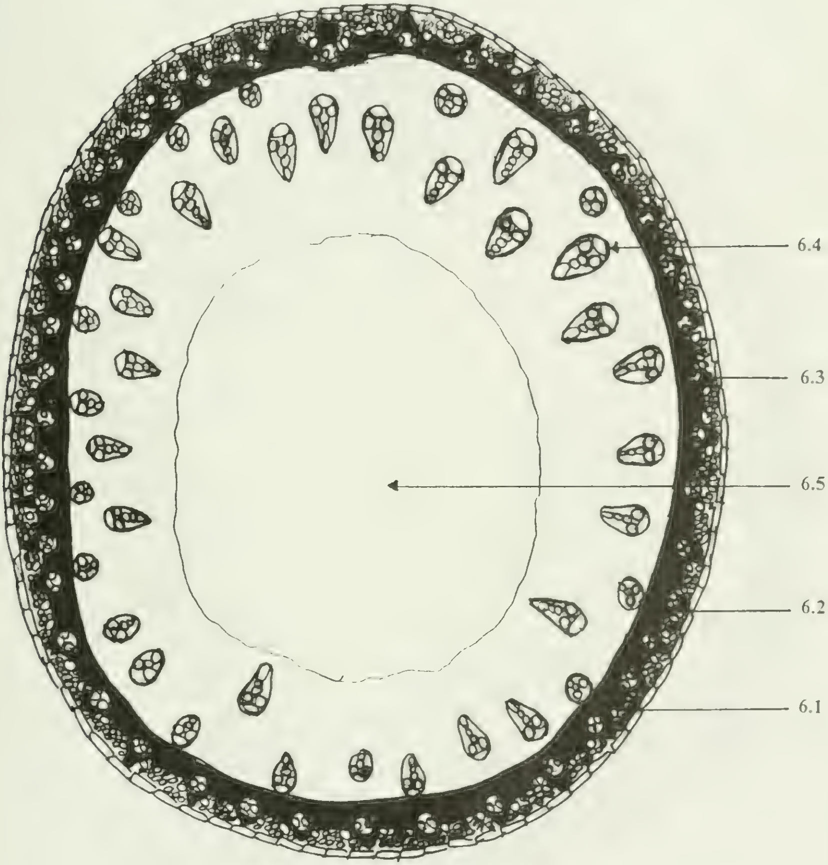

Fig. 6. Bouteloua elata Reeder & Reeder. Culm transversal section at the epinodal zone. Subepidermal ring of sclerenchyma alternating intermediate cells. 6.1) Intermediate cells. 6.2) Ring of sclerenchyma 6.3) Peripheral vascular bundles. 6.4) Internal vascular bundles 6.5) Medulla.

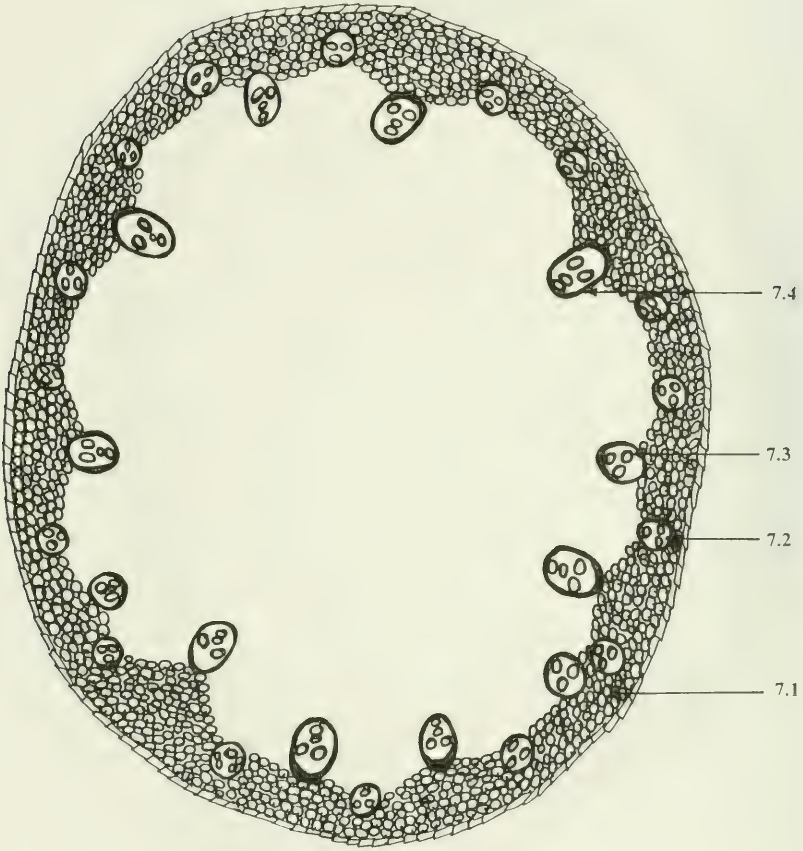

Fig. 7. Bouteloua vaneedenii Pilger ex Urban. Culm transversal section at the epinodal zone. Ring of intermediate cells with sclerenchyma only at the apex of the vascular bundles. 7.1) Intermediate cells. 7.2) Secondary peripheral vascular bundles. 7.3) Internal vascular bundles. 7.4) Sclerenchyma.

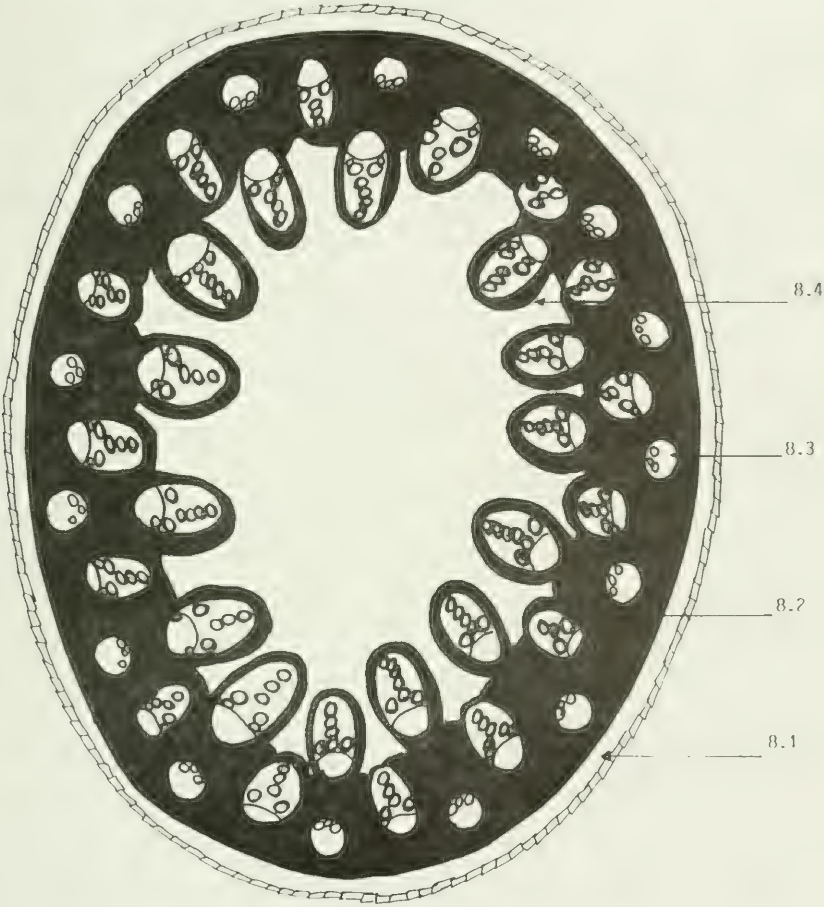

Fig. 8. Bouteloua radicosa (Fournier) Griffiths. Culm transversal section at the nodal zone. 8.1) Ring of parenchyma. 8.2) Ring of sclerenchyma. 8.3) Secondary peripheral vascular bundles. 8.4) Internal vascular bundles.

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ARIDAE, A NEW SUBCLASS OF LILIOPSIDA

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ABSTRACT

The assertion that Acoraceae and Araceae (including Lemnaceae) form a group distinct from Arecaceae requires the establishment of a new subclass, **Aridae**. Its position within Liliopsida (monocots) is between Triurididae and Liliidae. Arecidae is placed adjacent to Commelinidae.

KEY WORDS: Liliopsida, Aridae, nomenclature

On-going phylogenetic studies on Liliopsida (monocots) necessitate some taxonomic realignments. The combined analysis by Chase *et al.* (1995) demonstrates that Arecidae (*sensu* Cronquist 1988) is polyphyletic. The new subclass includes Acoraceae and Araceae (including Lemnaceae).

Aridae Reveal, *subclass et stat. nov.* based on the Latin description associated with a F.G. Bartling (*Ord. Nat. Pl.*: 25, 65. Sep 1830, as Class Aropsida ["Aroideae"]) name.

I accept the following subclasses in Liliopsida Scop., *Fl. Carniol.*: 228. 1760:

Alismatidae Takht., *Syst. Phylog. Magnolioph.*: 461. 1967. (alismatoids)
Triurididae Takht. *ex* Reveal, Novon 2:235. 1992. (triurids)
Aridae Reveal, Phytologia 81:142. 1997. (arids)
Liliidae Takht., *Syst. Phylog. Magnolioph.*: 473. 1967. (lilioids)
Arecidae Takht., *Syst. Phylog. Magnolioph.*: 425. 1967. (arecids)
Commelinidae Takht., Syst. Phylog. Magnolioph.: 514. 1967. (commelinids)
Zingiberidae Cronquist, Brittonia 30:505. 1978. (zingibers)

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